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OF THE

American Veterinary Medical Association

FORMERLY AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Ass'n.)

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EXECUTIVE BOARD ELECTIONS

This year will be an unusual one in that Executive Board elections will be held in five districts. One of these districts is an old one and the four others are new districts to be created as a result of the action taken by the Association on the recommendation of the Executive Board at the Detroit meeting (see the Journal, October, 1929, pages 497-501).

This is the year for the regular Executive Board election in District No. 5. However, as a result of splitting off certain territory from the present District No. 5, the states of Iowa and Minnesota alone will remain to constitute this district. The new district, to be known as Executive Board District No. 7, will consist of the following states and territories: Washington, Oregon, Montana, Idaho, Wyoming, North Dakota, South Dakota, Nebraska, Alaska, Hawaii and the Philippines.

The following states will be separated from the present Executive Board District No. 6: Missouri, Arkansas, Louisiana, Texas, Oklahoma and Kansas. Following this division, District No. 6 will consist of California, Nevada, Utah, Arizona, Colorado and New Mexico. The new district, to be split from District No. 6, will be designated as Executive Board District No. 8.

The New England States and New York are to be separated from the present Executive Board District No. 2. The new district thus created will be known as Executive Board District

No. 9. Likewise Michigan and Ohio are to be separated from the present Executive Board District No. 2. These two states will comprise the new Executive Board District No. 10.

In the district to be known as No. 8, the member of the Executive Board elected this year will serve for one year. In District No. 2 the member will serve for two years. In District No. 10 the member elected this year will serve for four years. In Districts 5 and 7 the new members will serve for the full term of five years. With the new arrangement in effect, the terms of the members of the enlarged Executive Board will expire at the rate of two each year, as far as the district members (elected by mail ballot) are concerned. The term of the member-at-large will expire in 1932. This member, however, is not elected by mail but will be elected at the convention held during that year. If an amendment that will come up for action at the Los Angeles convention is ratified by the Association, President Ferguson will automatically become a member of the Executive Board at Los Angeles. Likewise the President elected at that meeting will ex-officio become a member of the Board, bringing the personnel up to thirteen members.

Requests for nominations of candidates for the five places to be filled will be mailed to all paid-up members in the states affected six months before the date of the 1930 convention, as provided by the By-laws covering Executive Board elections. As usual, the polls will remain open for sixty days and then the election proper will be held.

PSITTACOSIS

A comparatively rare disease of birds, at least as far as the United States and Canada are concerned, and one which is discussed in a single paragraph of about a dozen lines in the latest English translation of Hutyra and Marek, has suddenly assumed sufficient importance to command whole columns on the front page of many of our large metropolitan newspapers. Even the news reels at the theaters have featured the disease. We refer to psittacosis, more popularly known as parrot fever or parrot disease.

Press dispatches from South America during the latter part of 1929 reported the existence of the disease in Argentina. Apparently very little attention was paid to these reports at the time. Latest available information would appear to indicate that the

disease has appeared in widely separated parts of the United States following the importation of parrots from South American points. Deaths of several persons have been reported as being due to the parrot disease. There is some evidence to indicate that all of these scattered outbreaks may have had a common point of origin in a shipment of parrots received by a New York importer during December.

Several months ago, it was reported that a theatrical company playing in Buenos Aires, Argentina, included in the cast a parrot which took the part of a sailor's pet. Sickness appeared among the members of the company and one actor and one actress died. Local physicians were unable to establish a diagnosis. Then the parrot took sick and died. The death of the parrot was ascribed to psittacosis, a rare disease as far south as Argentina. It is usually confined to areas in the northern part of South America where parrots are quite plentiful. Athough no direct connection appears to have been established between this occurrence and the appearance of psittacosis in the United States, it is just possible that there may have been some connection.

Among the cases of psittacosis that have been reported in the United States during the past month were three cases that made their appearance in a family at Annapolis, Maryland, early in January. An investigation revealed that a parrot purchased by a member of the family at a Baltimore pet shop had died on Christmas Day. Further investigation revealed that a veterinarian connected with the Baltimore pet shop had come down with the disease. It appears that following the death of the parrot in Annapolis the dead bird was returned to the pet shop in Baltimore and an autopsy held by the veterinarian who later was a victim of the infection.

By the latter part of January upwards of sixty cases of the disease in human beings had been reported in various parts of the United States. Eight of these cases resulted fatally. On January 24, President Hoover signed a proclamation prohibiting the importation of parrots from South America, in an effort to prevent the possibility of any further infection being introduced into this country.

As is usual in such cases, the newspapers have contained numerous ridiculous statements attributed to so-called experts and authorities of various kinds. It has even been stated that it is impossible for human beings to contract the disease from parrots. As a matter of fact, man *is* susceptible to the infection.

New Hill Memorial Library
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Bad outbreaks of the disease have been reported from time to time in several European cities. It very frequently happens that more than one member of the family comes down with the disease, undoubtedly the result of exposure to a common source of infection, which usually is a sick parrot. There seems to be some question as to whether or not the disease is actually communicated by one person to another, although there does not appear to be any good reason why this could not happen if the proper precautions are not taken to prevent it.

In parrots the disease is characterized by depression, inappetence and intestinal disturbances characterized by diarrhea. In human beings the disease takes the form of a pneumonia very frequently referred to as a so-called typhoid pneumonia.

The disease is caused by *Salmonella psittacosis*, described by Nocard almost forty years ago. The organism belongs in the rather large family of colon-typhoid intermediates, along with the old hog cholera bacillus and the organisms causing so-called food poisoning, bacillary white diarrhea, equine abortion, fowl typhoid, rat typhoid and about a dozen others.

Nip and Tuck

On January 2, 1929, our books showed that 1775 members had paid their dues for the year 1929. On the corresponding day this year, we had received remittances covering 1930 dues of 1782 members, seven more than one year ago. At the close of the year 1929, membership cards for that year had been issued to 4204 members.

APPLICATIONS FOR MEMBERSHIP

(See January, 1930, JOURNAL)

FIRST LISTING

ARMSTRONG, ROBERT S. 51 7th St., Salem, N. J.
D. V. M., Michigan State College, 1926
Vouchers: J. H. McNeil and Henry H. Haigh.

BADGER, FRED JOSEPH Kinderkamack Rd., North Hackensack, N. J.
D. V. M., Ohio State University, 1925
Vouchers: Leland D. Ives and Ira S. Pope.

BOWERSOX, WILLIAM I. 426 N. Yale St., Wichita, Kans.
D. V. M., U. S. College of Veterinary Surgeons, 1921
Vouchers: N. L. Townsend and C. B. Clement.

BRUNSCHER, LOUIS EARL Mulvane, Kans.
D. V. M., Chicago Veterinary College, 1920
Vouchers: Chas. W. Bower and Burton W. Conrad.

BULLIS, KENNETH LLOYD
Dept. of Vet. Science, Mass. Agri. College, Amherst, Mass.
D. V. M., Iowa State College, 1928
Vouchers: Henry Van Roekel and John B. Lentz.

BUSSEWITZ, RAYMOND H. Milton Junction, Wis.
D. V. M., McKillip Veterinary College, 1917
Vouchers: O. R. Marzillier and C. F. Van de Sand.

CAMPBELL, M. S. Brookfield, Mo.
D. V. M., Kansas City Veterinary College, 1915
Vouchers: Fred L. Seevers and J. D. Ray.

CANNON, EARL C. 614 S. Buckeye St., Iola, Kans.
D. V. S., Kansas City Veterinary College, 1909
Vouchers: N. L. Townsend and C. B. Clement.

GRAZIADEI, FRANCESCO SAVERIO 608 Kossuth Ave., Utica, N. Y.
D. V. M., Cornell University, 1929
Vouchers: W. G. Hollingworth and E. Sunderville.

GROTH, ARTHUR W. West Union, Iowa
D. V. M., St. Joseph Veterinary College, 1920
Vouchers: H. D. Bergman and J. F. McCabe.

HORN, W. L. Valders, Wis.
D. V. M., Chicago Veterinary College, 1916
Vouchers: T. H. Ferguson and C. F. Van de Sand.

JONES, JESSE A. 2637 Whittier Blvd., Los Angeles, Calif.
D. V. M., Kansas State Agricultural College, 1926
Vouchers: N. D. Cash and W. L. Curtis.

KELLY, RAY Bunceton, Mo.
D. V. S., Kansas City Veterinary College, 1911
Vouchers: Ralph Graham and J. D. Ray.

KERSHNER, PETER I. 303 E. A St., Hutchinson, Kans.
V. S., Ontario Veterinary College, 1891
Vouchers: N. L. Townsend and C. B. Clement.

KIRSCH, PAUL N. Carrollton, Mo.
D. V. M., St. Joseph Veterinary College, 1921
Vouchers: H. J. Hearrington and J. D. Ray.

KREUZIGER, MARTIN W. Chula Vista, Calif.
M. D. V. McKillip Veterinary College. 1910
Vouchers: W. L. Curtis and John L. Tyler.

LIEN, ANDREW P. Stanley, Wis.
D. V. M., Chicago Veterinary College, 1912
Vouchers: W. F. Nolechek and W. R. Swan.

LODGE, HARRY G. Clarksville, Iowa
M. D. C., Chicago Veterinary College, 1909
Vouchers: Grant B. Munger and John B. Bryant.

LUNNEEN, CLEMENT P. 953 Lucas St., Muscatine, Iowa
D. V. M., McKillip Veterinary College, 1917
Vouchers: C. A. Brandly and J. W. Joss.

MCINTYRE, G. W. Mexico, Mo.
D. V. S., Western Veterinary College, 1903
Vouchers: H. A. Wilson and Chas. E. Salsbery.

MARTIN, IVAN GEORGE 3000 Wells St., Milwaukee, Wis.
D. V. M., Indiana Veterinary College, 1924
Vouchers: T. H. Ferguson and C. F. Van de Sand.

MILLER, B. M. California, Mo.
D. V. S., Western Veterinary College, 1906
Vouchers: J. D. Ray and E. K. Glover.

MOSES, GEORGE Amboy, Minn.
D. V. M., Iowa State College, 1922
Vouchers: C. C. Hastings and H. C. H. Kernkamp.

MUTH, O. HERBERT Dept. of Vet. Med., Oregon State College, Corvallis, Ore.
D. V. M., Michigan State College, 1929
Vouchers: B. T. Simms and J. N. Shaw.

PARKER, SAMUEL R. U. S. Bureau of An. Ind., Box 338, Sacramento, Calif.
D. V. M., U. S. College of Veterinary Surgeons, 1913
Vouchers: Rudolph Snyder and M. S. Shahan.

PATTERSON, R. C. 624 Elm St., Emporia, Kans.
D. V. M., Colorado Agricultural College, 1921
Vouchers: F. B. Jones and N. L. Townsend.

ROBERTSON, LESLIE LEE Argyle, Wis.
D. V. M., Chicago Veterinary College, 1915
Vouchers: C. F. Van de Sand and V. S. Larson.

ROBERTSON, WILLARD THOMAS Hale, Mo.
D. V. M., McKillip Veterinary College, 1918
Vouchers: Fred L. Seevers and C. N. Hook.

SCHAULIS, HARRY EDWARD Clay Center, Kans.
D. V. M., Kansas State Agricultural College, 1929
Vouchers: J. F. Hemphill and Burton W. Conrad.

SCHNEIDER, JOSEPH EDWARD 530 Orchard Ave., Yeadon, Pa.
D. V. M., Ohio State University, 1917
Vouchers: G. A. Dick and Malcolm J. Harkins.

SCHREAR, ARTHUR F. Darlington, Wis.
D. V. M., Chicago Veterinary College, 1913
Vouchers: C. F. Van de Sand and V. S. Larson.

SHARP, FLOYD S. Ute, Iowa
D. V. M. Kansas City Veterinary College, 1916
Vouchers: C. C. Hastings and D. S. Weaver.

SUTTON, JAMES M. Sylvester, Ga.
D. V. M., Kansas City Veterinary College, 1914
Vouchers: E. D. King, Jr. and Wm. Moore.

TAYLOR, JAMES RODNEY Box 144, Manteno, Ill.
M. D. C., Chicago Veterinary College, 1904
Vouchers: Robert Graham and H. Preston Hoskins.

THOMPSON, WALTER W.
Akron Veterinary Hospital, 50 E. Buchtel Ave., Akron, Ohio
D. V. M., Michigan State College, 1929
Vouchers: C. H. Case and L. A. Stueland.

WARKENTIN, C. C. Shafter, Calif.
D. V. M., San Francisco Veterinary College, 1916
Vouchers: W. L. Curtis and John L. Tyler.

YARBROUGH, NATHAN R. Auburn, Iowa
D. V. M., St. Joseph Veterinary College, 1920
Vouchers: J. F. McCabe and T. L. Tierney.

Applications Pending

SECOND LISITNG

Abrevaya, Leon, c/o A. S. P. C. A., 24th St. & Ave. Ai New York, N. Y.
Brown, John C., Joy, Ill.
Caldwell, Geo. H., 1904 W. North Ave., Chicago, Ill.
Eiler, Edward Johnson, Mt. Sterling, Ill.
Gates, Orval L., c/o A. S. P. C. A., 24th St., & Ave. A, New York, N. Y.
Haworth, Charles C., Donnellson, Ill.
Herron, Hugh, Watseka, Ill.
Howe, Edward C., Troublesome, Colo.
Kilfoy, Leo T., 2508 Lawrence Ave., Chicago, Ill.
Kindred, T. H., Sioux Falls, S. Dak.
Lawton, William Curtis, 524 N. Jefferson St., Madison, Ind.
Osteen, Andrew Jackson, Belhaven, N. C.
Pirie, Leslie Daniel, Riverdale, Calif.

The amount which shall accompany an application filed this month is $9.58, which covers membership fee and dues to January 1, 1931, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

Alabama Veterinary Medical Association and Short Course for Practitioners. Alabama Polytechnic Institute, Auburn, Ala. February 2-7, 1930. Dr. C. A. Cary, Secretary, Alabama Polytechnic Institute, Auburn, Ala.

Manitoba, Veterinary Medical Association of. Winnipeg, Man. February 5, 1930. Dr. William Hilton, Secretary, 510 Greenwood Place, Winnipeg, Man.

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave., and 103rd St., New York, N. Y. February 5, 1930. Dr. Raymond J. Garbutt, Secretary, 305 W. 91st St., New York, N. Y.

Southeastern States Veterinary Medical Association. New Orleans, La. February 10-11, 1930. Dr. M. R. Blackstock, Secretary, 157 Hampton Ave., Spartansburg, S. C.

University of Illinois Veterinary Conference, Urbana, Ill. February 10-12, 1930. Dr. Robert Graham, University of Illinois, Urbana, Ill.

Kansas City Association of Veterinarians. New Baltimore Hotel, Kansas City, Mo. February 11, 1930. Dr. J. D. Ray, Secretary, 400 New Centre Bldg., Kansas City, Mo.

Chicago Veterinary Medical Association. Atlantic Hotel, Chicago, Ill. February 11, 1930. Dr. J. B. Jaffray, Secretary, 2956 Washington Blvd., Chicago, Ill.

Hudson Valley Veterinary Medical Society. Albany, N. Y. February 12, 1930. Dr. J. G. Wills, Secretary, 122 State St., Albany, N. Y.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. February 19, 1930. Dr. W. L. Curtis, 1264 W. 2nd St., Los Angeles, Calif.

Northwestern Ohio Veterinary Medical Association. Commodore Perry Hotel, Toledo, Ohio. February 20, 1930. Dr. F. A. Lambert, Secretary, c/o Columbus Serum Co., Station C, Box 53, Columbus, Ohio.

Ohio State University, Conference of Veterinarians at. Ohio State University, Columbus, Ohio. March 19-21, 1930. Dr. O. V. Brumley, Dean, Ohio State University, Columbus, Ohio.

Keystone Veterinary Medical Association. Philadelphia, Pa. February 26, 1930. Dr. C. S. Rockwell, Secretary, 5225 Spruce St., Philadelphia. Pa.

Ontario Veterinary Association. Prince George Hotel, Toronto, Ont., March 6, 1930. Dr. H. M. LeGard, 335 Main St. N., Weston, Ont.

THE CONTROL OF CANINE DISTEMPER BY THE LAIDLAW-DUNKIN METHOD OF IMMUNIZATION*

By ADOLPH EICHHORN, *Pearl River, N. Y.*

Canine distemper is a highly contagious, febrile disease of dogs which is characterized by discharges from the eyes and nose and later in the course of the disease by secondary involvements of the digestive and respiratory organs as well as the nervous system. The infectious nature of the disease has long been recognized and from time to time various organisms were incriminated as being causative factors of the disease.

Carré, in 1905, succeeded in reproducing the disease with the filtrate of the secretions and thereby classing the virus among the filtrable organisms. However, Carré's statement has not been generally accepted and even since that time other microorganisms isolated from distemper cases were considered the true etiological factors of the disease.

The unsuccessful efforts to control the disease and prevent the great losses which followed the infection resulted in a successful movement for funds under the auspices of *The Field*, in England, for the purpose of studying the disease with the aim for its ultimate control. This effort resulted in the creation of the Distemper Council, which included some of the most eminent scientists in Great Britain. With sufficient funds available for the investigations, it was possible to plan the work so that, if necessary, it could be carried on for a period of years.

After suitable premises were selected for that purpose, and precautions taken to insure the most thorough isolation of the animals purposely bred for the investigations, the work progressed step by step, until a method of immunization was developed which not only, on laboratory test, but in extensive field practice, proved effective. Dr. P. P. Laidlaw and Major G. W. Dunkin were chosen by the Distemper Council to conduct these investigations and a great deal of credit is due these investigators for their untiring efforts of study and successful accomplishment. Credit is also due Dr. J. B. Buxton, who in the early work took active part in the outlining and in the inauguration of these investigations.

*Presented at the sixty-sixth annual meeting of the American Veterinary Medical Association, Detroit, Mich., August 13-16, 1929.

Most veterinarians are familiar with the reports issued from time to time on the progress of the work. Therefore, it will not be necessary at this time to deal with these phases of the investigations, but merely to refer to the reports on the method of procedure which they followed regarding the careful planning of the work, especially their successful efforts in obtaining susceptible animals.

Another important phase which, no doubt, facilitated their progress, was the determination of the fact that ferrets are highly and more uniformly susceptible to the injection of virus than dogs. This fact not only proved of a great advantage in the study of the pure form of distemper, but also afforded an opportunity to carry, with a certain degree of regularity, the virus through passage so that it was at all times readily available for investigational purposes.

Distemper Caused by Filtrable Virus

The investigations, of course, were not limited to the development of a product for the prevention and treatment of distemper, but also to the study of the various phases of the disease with special reference to the etiology, pathogenicity and pathogenesis. While they have conclusively determined that the cause of the disease is a filtrable virus, they have not lost sight of the fact that other organisms must play an important part in the course of this disease.

After the true cause of distemper had been definitely established, it was essential that the role of the various bacteria isolated from distemper cases be determined; especially so, since some of these bacteria, no doubt, play an important part in the course of the disease, and as some of these organisms are commonly associated with the infection. That these bacteria are not unimportant is proven by the fact that they have been considered by prominent investigators as the true causes of distemper. Laidlaw and Dunkin, who have had excellent opportunities to observe and study the course of the disease produced with the pure distemper virus, are of the opinion that the pure distemper is generally not a fatal disease and, contrary to the prevailing views, do not attribute the fatalities to the action of the virus, but to the secondary bacteria.

It has not as yet been proven whether these secondary bacteria invade the infected animals after devitalization by the true virus, or whether they are taken up simultaneously with the virus. Whatever the case may be, the presence of these secondary

organisms is, no doubt, an important factor in determining the course of the disease and the great losses sustained from distemper in kennels and other similar establishments may be explained by the fact that these secondary organisms occur there very extensively as a result of their elimination from infected animals.

From experience, it is our opinion that the characteristic double febrile curve observed in experimental virus infections of dogs is an indication of the attack of the secondary organisms, which occurs after the virus has exerted its devitalizing effect. It is only following the second febrile rise that we observe symptoms associated with the secondary invaders and these manifestations very frequently occur only two weeks or even longer after the primary virus infection.

It appears to us that if the secondary bacteria enter the body with the virus, the symptom complex of the disease would manifest itself earlier than is usually observed following the injection of the pure virus. This conception is also substantiated by the fact that by effectively immunizing animals against the virus form of distemper, they will not become a prey to the infections resulting from the secondary invaders.

Older Dogs Usually Immune

The known fact that older dogs are not susceptible to the disease, and that even in cases where dogs in their young age were known to have been exposed to the disease and apparently failed to develop distemper, may be attributed to the mild nature of the infection with the pure virus, when no complications follow. Such cases may recover without disclosing visible symptoms and remain immune throughout the rest of their life. The common experience observed on the immunity of older dogs would substantiate this contention.

Laidlaw and Dunkin in their investigations found that while the virus is present in the blood, during certain stages of the disease, it is not found there in such concentration, as for instance, in hog cholera. On the other hand, they found the virus in the greatest concentration, persistently present in the spleen, abdominal lymph-glands, and to a lesser degree in the liver and brain of those cases which showed nervous symptoms. While their investigations were directed towards the isolation and cultivation of the virus, thus far they have been unsuccessful in their efforts.

Another interesting and important factor, established by the investigators, is the fact that the virus possesses a certain affinity towards the cellular elements of some of the organs. They found in their successful development of a vaccine produced from the organs invaded by the virus that it is essential to incorporate the cellular elements in the product. The investigations, however, until now, failed to reveal what relation the virus has to the cells, and whether the virus might not be present as cell enclosures, a conception now generally recognized with many of the filtrable viruses.

In their study of the nature of the virus, the English investigators found it to be very unstable and their early efforts towards preserving it and at the same time retaining its viability and virulence were unsuccessful. It is natural that all the various known methods for the preservation of virus, both chemical and physical, have been employed. They found that the only preservative which can be depended upon is freezing, under which condition the virus will retain its potency for several months, but under other conditions it maintains its effectiveness for only several days.

Dried Virus Retains Virulence

More recently, they have succeeded in drying the virus in vacuum over phosphorus pentoxid and such dried virus they found to retain its potency for at least four weeks. We have received such dried virus and proved its virulence six weeks after its preparation. This is a material advantage, as it enables the distribution of the virus in a potent state.

Laidlaw and Dunkin have further established that in canine distemper there is no multiplicity of strains and that one strain of virus is effective in reproducing the disease as well as for active immunization.

In the early immunization work, dating back to 1926, ferrets were used and it has been conclusively established that a vaccine prepared from the tissues of ferrets was absolutely effective in protecting these animals from distemper. Subsequent experiments, however, have shown that the ferret vaccine is not dependable for the immunization of dogs and vice versa.

They found that the antigenic or immunizing properties of the virus are the least affected by formolization and also that virus obtained from the spleen and lymph-glands of infected dogs after

formolization will protect susceptible animals against many hundred infective doses of distemper virus. This has been proven with a uniform degree of regularity. Such immunity, however, lasts apparently only for several months and in order to render such immunity lasting and solid, it is necessary to follow up the injection of the vaccine with a pure virus. This procedure confers upon the animals a solid, lasting immunity, not only to artificial infection of large doses of virus, but also on continuous exposure to distemper under field conditions.

The procedure of active immunization, therefore, requires two injections; one with the vaccine, which is administered subcutaneously, followed in two to three weeks by the intradermal injection of active virus. The vaccine, consisting of the formolized tissues suspended in salt solution, when kept cold, will retain its keeping qualities for a period of at least six months, whereas, the virus in a dried form should retain its potency for a period of four weeks.

In order to produce dependable results, it is natural that the products must be prepared with the most accurate technic and the method of preparation executed in every detail as recommended by Laidlaw and Dunkin. It is especially important that each lot of vaccine, and not to a lesser degree each lot of virus, be tested for its potency on ferrets or dogs and unless this is carefully carried out, the vaccination may fall into disrepute and thereby the effectiveness of the vaccination might be undeservedly discredited.

Anti-Distemper Serum

Efforts to produce an anti-distemper serum are also in progress and are very promising. Laidlaw and Dunkin have established that repeated injections of the virus containing spleen and lymph-glands from infected dogs into immune dogs (hyperimmunization) will produce a serum rich in immune bodies, which, when injected into susceptible animals, will protect them against many fatal doses of distemper virus. The advantage of an immune serum is apparent since such serum can be applicable for immediate protection and also for curative purposes.

We have in progress investigations on hyperimmunization of dogs with a view to producing a highly potent, immune serum. The best results thus far have been obtained by several mass injections of blood from artificially infected pups, the blood being taken during the second febrile attack. Comparative tests also

are being conducted with the serum obtained from dogs hyper-immunized with repeated injections of saline suspensions of organs containing the virus of distemper.

It is hoped that these investigations will reveal that a serum might be produced which could be utilized not only for passive immunization or simultaneous immunization with active virus, but also for curative purposes in the early stages of the disease.

The Laidlaw-Dunkin method of immunization has been carried out in practice for a period of two years under normal and adverse conditions. In *The Veterinary Record*, February 2, 1929, Major A. A. Comerford published a paper on "Two Years' Field Experience with the Preventative Treatment of Distemper as Advocated by Laidlaw and Dunkin," in which a careful account is given of the results of immunizing dogs by this new method. The results were uniformly, it might be said, 100 per cent successful. At the meeting at which this paper was presented, the writer had the pleasure of listening to others who had had the opportunity of using this method of immunization and the general impressions were that at last a method of immunization against distemper has been developed which may be depended on to protect susceptible dogs against the infection.

Writer Visits Mill Hill

The writer, who, with the authorization and commission from the American Distemper Committee, had the privilege of visiting the laboratories at Mill Hill and of conferring with the investigators, has returned very much encouraged with the results. The writer also takes this opportunity to express his appreciation to all those in England who extended to him numerous courtesies, especially to Dr. P. P. Laidlaw and Major G. W. Dunkin, who at all times were ready to furnish him with all the desired information and demonstrations.

We have distributed approximately 10,000 doses of vaccine and virus to veterinarians in the United States. While it is too early to determine the duration of immunity conferred upon the animal with this method of vaccination, it is a gratifying fact, nevertheless, that until now we have not learned of any instances in which the vaccination was followed by unfavorable results.

The immunization against canine distemper by the Laidlaw-Dunkin method, being conducted with a filtrable virus, must be regarded in a similar light as the immunization against hog cholera

and the same principles which are to be observed in the vaccination against hog cholera should also follow the vaccination against canine distemper. That is, care must be exercised to vaccinate only such animals as are in a fit condition to receive the treatment.

As the vaccination requires the administration of live virus, it is advisable that the veterinarian should keep in touch with the vaccinated animals so that in case of necessity, he would be in a position to undertake such modification in the procedure which would safeguard the dog from any bad results. That is, in case any reaction develops after the first inoculation, the administration of the virus should be delayed until all evidence of the reaction has disappeared. If possible, vaccinated animals should be kept from distemper cases, at least for a period of one week following the injection of the vaccine.

It is hoped that it will now be possible to proceed in the United States with the active immunization of dogs against canine distemper and no doubt all parties interested will feel grateful to those who were instrumental in inaugurating the investigations and, above all, to the eminent scientists who have successfully solved the great problem of the prevention of canine distemper.

Discussion

Member: Is there any danger of transmitting the disease to other puppies, by this method of immunization?

Dr. Eichhorn: I should think there would be some danger. There is no positive information available that such transmission has occurred. Nevertheless, inasmuch as we are dealing with an active virus, there always is the possibility that the injected animals may eliminate such virus in sufficient quantities to transmit the disease to susceptible animals. Such danger, however, is very slight; yet, it is advisable that following the injection of the virus the animals should not be permitted to come in contact with susceptible animals.

It might be advisable, at this time, to emphasize that only animals which are in good condition should be subjected to the vaccination. Dogs which are not in a fit condition, either from severe parasitic infestation or from any other causes, would not respond to the vaccination. However, if the animals are physically in good condition and upon examination they are found to be in normal, good health, they will respond to the vaccination without the least ill effect and a solid immunity will follow.

Dr. F. F. Parker: Is a veterinarian ever safe in using the virus alone? I think it is almost necessary to use the serum. Do you not recommend that it should be used three or four weeks prior to the vaccine?

Dr. Eichhorn: Of course, it would be a rather dangerous procedure to use the virus before the vaccine has been administered. It should be remembered that the virus is active and therefore, no doubt, in many instances, would produce the disease.

In our experience on several thousand dogs, we found that not all pups are susceptible. When we first undertook production work, we procured our dogs from all sources, especially so from various pounds; and while we expected a large proportion of the dogs from such sources to be immune, we found, as a matter of fact, that about 85 per cent of the animals did not respond to the injection of the virus. Later, we obtained pups from other sources, where we were reasonably certain that the animals had not been exposed to distemper,

and we found that about 40 per cent of active distemper resulted from the inoculation of the virus into this type of dogs.

On the other hand, in the experimental work in England where the animals have been reared in compounds under strict isolation, they obtained almost 100 per cent susceptible animals.

It is generally known that a great majority of aged dogs are absolutely immune against distemper. As a matter of fact, we have found that animals over two years of age developed distemper only in exceptional cases, even upon the inoculation of a large dose of active distemper virus. This may be explained on the grounds that these animals have gone through an attack of the disease some time during their life.

With our present knowledge of the nature of the virus of distemper, it may be assumed that many animals affected with the pure virus of distemper may pass through the attack without developing any complications. Such attacks are manifested only in a rise in temperature with a subsequent drop to normal and it is readily conceivable that many dogs may pass through such an attack without it being recognized. This may explain why we find so many aged animals positively immune against the disease.

MEMBER: Does the serum have any curative effect? Quite often the owner does not bring the dog in until he imagines there is something wrong. Now, if such a pup has distemper, would the serum have any beneficial effect?

DR. EICHHORN: The vaccine is only a preventive. The English investigators are working at the present time towards the development of a curative serum. They have obtained some success but are not, as yet, ready to make definite claims for it. At the present time, no claim is made whatsoever for the vaccine for curative purposes.

DR. W. L. CURTIS: At the meeting in California that was held in June, one veterinarian indicated that he had several litters of young pups that died less than six weeks old. Now, it happens to be a fact that it is possible for a young pup to develop distemper before it is weaned. I am not sure that condition exists all over the country, but I am sure it is common in California. Now, this veterinarian stated that for the last several months he had been injecting (in a small dog) around 2 or 3 cc of this vaccine alone and he also claimed that he had produced immunity in these pups because he did not follow the vaccine with virus. I would like to hear Dr. Eichhorn speak, if possible, on the possibility of using this vaccine alone in dogs younger than three months.

DR. EICHHORN: No harm can result whatsoever from the use of vaccine alone on young dogs. An immunity might be produced even before the dogs are weaned. However, the vaccination of suckling dogs is not recommended, because it is recognized that such dogs possess a certain degree of immunity from maternal sources, which, as a rule, carries them through until they are weaned.

The active immunization of pups possessing such partial immunity would naturally not be so complete as if they had not possessed a partial, natural immunity. For this reason, it is best to wait until the dogs are weaned and the natural resistance has passed, before vaccination is undertaken.

The experimental work on the vaccination of suckling pigs, which was carried out on a very large scale, has also proven that while the vaccination of such pigs may be effectively carried out in a large number of cases, yet, there are times when vaccinated, suckling pigs, later in life, do not possess sufficient immunity to resist even natural exposure.

I do not see, however, any reason why the vaccination of pups under three months might not be undertaken, especially so when there is danger of exposure to distemper.

DR. J. ELLIOTT CRAWFORD: I think it might be well for Dr. Eichhorn to tell the gentlemen here that one particular trouble, in injecting this vaccine, if you inject it in one place or even in two places, unless you inject it slowly, is that abscesses will invariably develop at the site of the injections.

DR. EICHHORN: We have administered the vaccine to many hundred dogs without the formation of a single abscess. The development of an abscess is, in reality, a tissue reaction and is not the result of a contaminated vaccine. The tissue reaction develops from the solid material which the vaccine contains. Inasmuch as the distemper virus apparently possesses an affinity

towards the cellular elements of some of the organs, it is imperative, as proven by experimental work, that the vaccine should contain the cellular elements of the organs from which it is prepared. If the vaccine is freed of such cellular element, its effectiveness is diminished.

Up to date, no definite information is available on the relationship of the virus to the cellular element, but there is a possibility, the same as applies to other viruses, that it might be present in the cells during certain stages of its development in the form of "cell inclusions." If this is the case, this may explain the necessity of having the cellular elements of the organs containing the virus included in the products used for vaccination purposes.

The injection of any product containing a considerable amount of solid material may always result in a tissue reaction and subsequent abscess formation. In the case of distemper vaccine, this may be readily avoided by injecting the dose at two or even three points and by applying a gentle massage upon the injected area. A diffusion of the vaccine results, which facilitates its absorption.

We may definitely state, however, that the abscess formation is not due to a contamination of the product and therefore, by following the recommended technic, it may be entirely avoided. As a matter of fact, there are many veterinarians who have administered several hundred doses of the product without the development of a single abscess.

MEMBER: At what part of the body is the injection made?

DR. EICHHORN: The injection is made preferably into the withers. The English apply this term even to dogs, although it is customary in the United States to refer to the withers only in horses. That place is given in preference to any other part of the body, as the dog cannot readily reach that place with his mouth when, following the injection, a slight irritation annoys the animal. Therefore, to avoid any contamination by the dog's mouth, the withers has been chosen as the best place for the inoculation.

MEMBER: Do you have any trouble making intradermal injections?

DR. EICHHORN: No, it is very simple; no trouble whatever is experienced in injecting the virus intradermally.

MEMBER: What is your procedure if, after the injection of vaccine, the dog develops a case of distemper.

DR. EICHHORN: In case distemper is observed to have developed after the injection of vaccine, which, of course, would only be incidental, as the vaccine cannot produce the disease, the virus should not be injected. In fact, following the vaccination, the veterinarian should follow the case and only if the dog is absolutely normal should the injection of the virus be made.

MEMBER: Does it make any difference whether you get it in the skin or under the skin?

DR. EICHHORN: While I do not believe there is any danger if the virus is injected under the skin, nevertheless, for the best results, the virus should be injected intradermally; that is, into the layers of the skin.

As to the amount of the injection of virus, after a well executed injection, a bleb the size of half of a pea develops as a result of the injection, which constitutes a sufficient quantity of the virus for the active immunization. The dose of the virus, at the best, is only relative, because it is impossible to determine the amount of active virus present in a given dose.

DR. CRAWFORD: I might say we are using this vaccine in the hospital. I always take the procedure of giving the dogs a dose of serum with the first dose of vaccine. That reinforces them and probably produces some immunity while the vaccine is taking effect.

MEMBER: What is the dosage of this virus? I have used several doses of it. It seems to be the same for a small animal as it is for a large animal and I wondered if this dose they are giving to a small animal would in turn immunize a large animal. I would like to know if we do not have to increase the dose for the size and weight of the animal.

DR. EICHHORN: It does appear very logical. On the other hand, the investigators claim that the dose has been determined from actual observation on the average tolerance of the virus by the animals with the subsequent development of a solid immunity. Now, it is very possible that a small dog might be fully immunized with half a dose, but it has been found that the given dose is sufficient for all animals and without danger even to the small dogs.

EXPERIMENTS TO DETERMINE THE MINIMAL LETHAL DOSE OF HOG-CHOLERA VIRUS*

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Introductory

In the carrying out of experiments designed to determine the minimal lethal dose of hog cholera virus, there are at least two factors of importance that must be taken into account. For one thing, it is a well-known fact that pigs vary greatly in susceptibility with age and weight and it is also true that different strains of hog cholera virus may vary considerably in pathogenicity or degree of virulence.

The ideal way to conduct experiments of this kind would be to have on hand at one time a sufficient number of susceptible pigs of a suitable size, say from forty to sixty pounds in weight, and of as nearly uniform susceptibility as possible, and to inject these pigs with graduated and diminishing doses of one lot of virus, known to be of good virulence. Even then difficulties will be met with, because of the variations in susceptibility frequently encountered in pigs of the same weight obtained from one farm and sometimes in pigs from a single litter. As a rule, pigs in a given litter are apt to be of more or less uniform susceptibility, but this is not always the case, for now and then one or two natural immunes are found in a litter of otherwise highly susceptible pigs.

Previous Experimental Work

King and Wilson[1] carried out a few experiments at the Kansas Agricultural Experiment Station, in 1910, with virus serum diluted with sterile salt solution. They found the minimal fatal dose of virus serum to be somewhere between 1/215 and 1/300 of a cubic centimeter for pigs weighing 50 pounds.

At the North Dakota Agricultural Experiment Station, in 1920, Roderick and Schalk[2] carried out a more extensive series of experiments with virus serum diluted with sterile salt solution. These investigators found that doses varying from 1/50 to 1/50,000 of a cubic centimeter were sufficient to cause the death of susceptible pigs weighing from 30 to 60 pounds, but the virus

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dilutions were not carried far enough to define or determine a minimal lethal dose. Roderick and Schalk's results, however, showed that doses as small as 1/50,000 cc of virus serum were sufficient to cause a fatal infection.

It is rather difficult to account for the wide variation in the results obtained by King and Wilson as compared with those of Roderick and Schalk. King and Wilson, however, based their conclusions on results obtained from the injection of only three pigs, which received doses of 1/215 cc, 1/300 cc, and 1/431 cc of virus serum; only one of these three pigs exhibited a mild reaction at the end of seventeen days and it would seem that King and Wilson must have been working with a virus of very low pathogenicity or virulence. Roderick and Schalk, on the other hand, were evidently using a highly virulent strain of virus in their experiments.

Present Experiments

The experiments described in this paper were carried out at various times, in conjunction with other experimental work, over a period of several years.

In view of the fact that the experiments were carried out intermittently, it was necessary to use many different lots of pigs and the experiments could not therefore be carried out under the ideal conditions pointed out in the beginning of this paper. In spite of the fact that many different lots of pigs were used in the experiments, that is to say, pigs obtained from different farms and from many different litters, the test animals used in the experiments were nevertheless of remarkably uniform susceptibility. That the pigs were of such uniform susceptibility was no doubt due to the fact that care is always exercised in the purchase of pigs for experimental work, to see that they come from farms where vaccination is not practiced.

Defibrinated virus blood was used in making all of the inoculations and the small doses were obtained by a series of dilutions or multiple dilutions with sterile normal salt solution. As a rule, the dilutions were carried out in such manner that 5 cc of the final dilution furnished the required dose.

The same strain of virus was used in all of the experiments. This was a "stock" virus, propagated at the B. A. I. Experiment Station at Ames, and kept at a more or less uniform degree of virulence by successive passages through susceptible pigs weighing from 40 to 60 pounds.

In several instances, portions of the undiluted virus blood were held in sealed glass bulbs or small, sealed vials within temperature limits of 40 to 50° F. for four or five weeks with a view to determining whether there was any multiplication of virus in defibrinated virus blood held *in vitro* at such temperatures. These portions of virus blood, which were held at refrigerator temperatures, were later diluted with normal salt solution in the same manner as the freshly drawn virus blood and injected in the same doses. This was done because of an observation made some years previously by Dr. Dorset, at Washington, in which it seemed that a sample of defibrinated virus blood drawn in the fall of the year, sealed in glass bulbs, and held in the ice-box during the entire winter, had apparently increased in virulence when it was injected into susceptible pigs in the following spring. It was thought that this point might be determined by comparing the effects of very minute doses of the cold-stored blood with corresponding doses of the fresh blood.

In selecting virus for the different experiments, cultures were first made from the virus blood itself and from the various organs of each of the pigs which furnished the virus blood. This was done with a view to determining whether the animals were suffering from a secondary infection with *Salmonella suipestifer*. Blood was taken only from cholera-infected pigs which were found to be free from *S. suipestifer*.

In summarizing the results of the experiments and comparing the effects of varying and diminishing doses of virus, the incubation period, or interval between the injection of virus and the appearance of first visible symptoms, and the survival period, or interval between the injection of virus and death of the animal, were used as a basis of comparison.

Summary and Discussion of Results

In these experiments, which were designed to determine the minimum lethal dose of hog cholera virus, forty-seven pigs were used. The pigs were remarkably uniform in susceptibility, considering the fact that they came from a number of different farms and from many different litters.

Ten pigs were injected with from 2 to 5 cc of undiluted virus blood to serve as controls on the virulence of the virus and to afford a basis of comparison between ordinary virus doses and the minute doses obtained by dilution. All of these pigs sickened as a result of the injections. Seven were allowed to die, while two were

killed for virus. In this group, the average incubation period was 4.8 days and the average survival period was 15.1 days.

Thirty-one pigs received injections of defibrinated blood ranging from 1/1,000 to 1/100,000 of a cubic centimeter. All of these pigs sickened as a result of the injections and all died except two. One developed a subacute type of hog cholera and recovered in worthless condition, while one showed only a transient reaction and was later found to be immune when injected with 10 cc of virulent virus. In this group the average incubation period was 5.8 days and the average survival period was 16.5 days.

Three pigs received injections of virus blood ranging from 1/150,000 to 1/300,000 of a cubic centimeter. All of these pigs sickened and died. The average incubation period in this group was 6.6 days and the average survival period was 25.3 days. One pig injected with 1/400,000 cc of virus blood showed only a transient reaction, while two pigs which received 1/500,000 cc remained well.

A summary of the experiments is shown in table I.

TABLE I—*Summary of experiments to determine the minimal lethal dose of hog cholera virus*

VIRUS INJECTED* (CC)	PIGS INJECTED WITH EACH DOSE	INCUBATION PERIOD (AVERAGE DAYS)	SURVIVAL PERIOD (AVERAGE DAYS)
2	8	4.7	17.6
5	2	5.0	14.5
1/1,000	2	5.0	19.0
1/2,000	4	5.5	14.0
1/2,500	2	5.5	19.5
1/3,000	4	6.0	18.2
1/4,000	2	5.0	16.5
1/5,000	2	5.0	14.5
1/25,000	8	6.0	14.7
1/50,000	4	6.0	14.2
1/100,000	3	7.0	17.5
1/150,000	1	7.0	31.0
1/200,000	1	7.0	25.0
1/300,000	1	6.0	20.0
1/400,000	1	6.0	Slightly sick, good recovery
1/500,000	2	Remained well	—

*All injections were made with fresh, unphenolized virus, the small doses being obtained by dilutions or multiple dilutions, made with sterile, normal salt solution. The weights of the pigs ranged from 35 to 65 pounds.

In comparing the result of the inoculations of diminishing doses of defibrinated virus blood, as shown in table I, it will be noted that when extremely minute doses were reached, ranging from 1/100,000 to 1/500,000 cc, there was a noticeable lengthening of the

incubation period as well as of the survival period until a point was finally reached where the injections were of no effect. These experiments would indicate that the minimal infective or fatal dose of the particular strain of virus used was between 1/300,000 and 1/400,000 of a cubic centimeter. The experiments would also indicate that when the virus dose is made sufficiently low, a point is reached where the natural resistance of the animal organism is able to overcome the very minute amount of virus injected and there may be a slight or transient reaction from which the animal soon recovers.

In comparing the inoculations of minute doses of freshly drawn virus with the equivalent doses of the same virus held for four or five weeks at cooler temperatures (40 to 50° F.), there was no apparent difference in the results, as judged by the average incubation periods and the average survival periods. This would seem to indicate that no multiplication of the virus takes place in defibrinated blood when stored *in vitro* at a temperature of 40 to 50° F.

REFERENCES

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[2]Roderick, L. M., and Schalk, A. F.: Collected studies on hog cholera. N. Dak. Agr. Coll. Exp. Sta. Bul. 210 (1927).

DISCUSSION

DR. C. N. MCBRYDE: This is just preliminary work. We are now going to attempt to determine the quantitative distribution of virus in the blood, in the cells, in the serum, and in the tissues of the body. This paper does not have any bearing on immunization work.

DR. JOHN REICHEL: The data that we have here are certainly very interesting. I am rather puzzled, however, at the attempt to establish the minimal lethal dose for such a substance as hog cholera virus. It perhaps would be better to try to establish the minimum infective dose—but you withdrew it.

You are really establishing the minimum effective dose, and that, as you say, lies between 1/300,000 and 1/400,000 of a cubic centimeter. It is rather striking that when an animal is injected with 5 cc of undiluted virus—there is an incubation period of a little over four and one-half days, whereas with 1/20,000,000 of that dose, the only appreciable difference is that the actual incubation period is three days longer.

Now, what we really want to know, aside from the minimum infective dose, which I think is established so well with your virus, is to what degree of concentration the virus must be present to cause an animal to show symptoms at the end of the period of incubation. To what degree of dilution will virus of that sort lend itself to establish an infective dose again?

I think this work is fundamental. It paves the way for finding out what immunizes, and we know it takes virus to immunize. We have always held that it isn't live virus that immunizes. It is dead virus that immunizes. How much dead virus must be present in an animal to immunize actively? It takes a definite amount of dead virus to do it. The average pig injected either with virus alone or with virus and serum will, before it becomes immune, develop a definite amount of virus, which, in turn, is killed by the animal. Otherwise the animal is killed by the virus, and it is that reaction to the amount of dead virus that imparts the active immunity.

I, myself, am delighted with the data.

DR. H. W. SCHOENING: It might be of interest to note the similarity or the lack of similarity between the virus of hog cholera and the virus of foot-and-mouth disease. The virus of foot-and-mouth disease has been found to be active in dilutions as high as 1:10,000,000 when tested out on guinea pigs. When you get up to dilutions around 10,000,000, the incubation period, however, is considerably lengthened. This may have a bearing on the epizoology of the two diseases, that is, from an infectious standpoint. Foot-and-mouth disease is much more infectious than hog cholera.

New Regulations for Alabama

According to an announcement made by Dr. C. A. Cary, state veterinarian of Alabama, the State Live Stock Sanitary Department of Alabama has adopted two new regulations, effective February 1, 1930.

Regulation 19 A. All chickens for breeding purposes shipped or moved into Alabama shall pass the standard intradermal tuberculin test before being shipped or moved into Alabama. This test will not be required of baby chicks or any chickens under four months old and from states where there is less than one-half of one per cent of tuberculosis in the chickens in the state of origin. The percentage of infection shall be determined by federal and state authorities and records.

Regulation 68. The use of infectious abortion vaccine is prohibited in all cases in Alabama, except when the State Veterinarian shall issue a specific written permit.

Entrance to Veterinary School, Alfort.

MILITARY MEAT AND DAIRY HYGIENE IN RELATION TO ARMY HEALTH*

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Prior to the organization of the Veterinary Corps as a component of the Medical Department, in conformity with the provisions of the National Defense Act of June 4, 1916, the inspection of foods of animal origin, intended for military purposes, was a sketchy affair, of limited scope, lacking proper authority and coordination, and not particularly satisfactory.

It is true that for several years prior to 1916, a few veterinarians were employed by the Subsistence Department of the Army, to inspect meats and meat food products in some of the larger packing centers, and it was from this small nucleus that the meat inspection service was formed during the World War, and thus gradually has been developed an agency which has an important part in the sanitary activities concerned with the welfare of our military forces, these activities being grouped in the Medical Department, and administered by the Surgeon General of the Army.

The veterinary service with humans, *i. e.*, that phase concerned with the examination of food supplies, is a matter of sanitation and is a direct extension of the sanitary service of the Medical Department, which is charged with responsibility in all matters concerning the protection of the health of the troops.

The Army Veterinary Service as a part of the Medical Department is charged with duties and responsibilities concerning all food supplies of troops that are of animal origin, including an investigation into the sanitary origin, soundness of quality and sanitary conditions of meats and meat food and dairy products prior to and at time of purchase, while in storage and at issue; the sanitary condition of establishments, storehouses, freezers, refrigerators, refrigerating space in cars, ships and other places in which such supplies are manufactured, handled, stored, shipped or issued; the sanitary condition of dairies and milk herds supplying troops; and for making recommendations with reference thereto, and with the instruction of veterinary personnel in the performance of the foregoing duties.

*Presented at the sixty-sixth annual meeting of the American Veterinary Medical Association, Detroit, Mich., August 13-16, 1929.

The veterinary meat and dairy hygiene service is essentially hygienic and sanitary in its nature. Its purpose is to protect the health of the troops by preventing the purchase or issue of meat and dairy products which by reason of their source, nature, handling, or condition may be unsafe or unsuitable for food purposes.

In accomplishing these objects, it is highly essential that there be the fullest cooperation between the inspection and purchasing services, in order that the interests of the government may be protected from both a sanitary and economic standpoint. This paper being concerned with the hygienic phase only, no further reference will be made to the important economic aspect.

The federal meat inspection act provides for the inspection of meats intended for interstate shipment by the Department of Agriculture, and Army regulations require that such supplies, purchased for the Army, be inspected and passed by this agency insofar as it concerns antemortem and postmortem examinations. It is not contemplated that the veterinary service duplicate this work, but as an Army agency to take over the inspection of supplies purchased, or offered for purchase, accepting the findings of the Department of Agriculture as far as they go, and completing for the Army the inspection to the point of issue to troops.

In the field and in other places where the federal meat inspection act is nonapplicable, the fitness of such supplies may depend entirely on the inspection of the Army veterinary service, unless a satisfactory state or municipal inspection is maintained.

Scope of Inspection

Information concerning the condition of food supplies of animal origin is obtained through veterinary or medical sanitary inspections of establishments including carriers, and in an examination of the foods and live animals, beginning at the source of origin or the first point of contact with the military service and ending with the issue to troops or other disposition.

Inspection of these food supplies is further subdivided as:

1. Inspection prior to purchase.
2. Inspection at receipt.
3. Inspection during transportation.
4. Inspection during storage.
5. Inspection at issue to troops or other disposition.

The inspections prior to purchase include antemortem and postmortem examinations of food animals; inspections during manufacture, including handling and shipment; or when supplies are offered for sale to organizations, as messes, or to the Government at purchasing points, at stations or in the field.

The inspection on receipt is the inspection made when and where the supplies are acquired or accepted, either at purchase by a purchasing officer or by the troops directly, or by shipment from a supply officer to a storage or issue point.

The inspection during transportation is the examination made of food supplies at time of loading into, and unloading from, vehicles, cars, boats or other carriers, and includes sanitation of carrier, soundness of products, their proper conservation and other required factors.

The inspection during storage is the inspection of food supplies subsequent to their procurement or acceptance and prior to their issue or shipment from one station to another. These inspections are of the nature of re-inspections of the extent and thoroughness required by existing conditions. This class of inspection is practically limited to the service at supply depots and at stations.

The inspection at issue to troops is the final veterinary inspection given food supplies, is essentially for soundness, and pertains entirely to the service of stations and in the field. So far as practicable it is a piece inspection.

Products Inspection

As pertaining to the Army Veterinary Service, products inspection includes all inspection procedures, organoleptic or laboratory, other than antemortem and postmortem, applied to food supplies of animal origin. These products in part are: beef, veal, mutton, goat meat, pork, poultry, rabbits, fish, game and other meats, oysters and other marine products, eggs, milk or cream; whether fresh, chilled, frozen, cured, dessicated, comminuted, canned or otherwise processed or prepared in any manner, including all food supplies of which they form an essential part; rendered or prepared fats of animal origin as lards, lard substitutes or compounds, oleomargarine and butter; also cheese, condensed milk, powdered milks, malted milks and others.

Veterinary inspection procedures include the sanitary source of these products, their selection, grading for purchase, the initial

inspection and reinspections, and the sanitary supervision of the various processes involved in chilling, freezing, curing, smoking, pickling, drying, canning, rendering, manufacturing, branding, labeling, weighing, packing, shipping, and other manipulation of products. From the foregoing it is evident that every attempt is made through initial inspection at origin or first point of contact with the military service, and through repeated reinspections until final issue to troops, to insure that these products are suitable in both quality and condition. This continous supervision reduces to a minimum the danger of individuals or possibly entire military commands being incapacitated through the consumption of products unsuitable or unwholesome in any manner. The procedure of continuous supervision and inspection from origin to final disposition is not always possible in civil life, where in some instances veterinary inspection is entirely lacking, and in other instances where it is not practicable to maintain inspection after the product has left the jurisdiction of the federal, state, municipal or other inspection agency.

It is appreciated that the civilian individual or community is entitled to protection in this respect, to the greatest possible degree, and in the military establishment where the success or failure of a war may be dependent upon the quality and character of the food supply, the protection afforded by adequate veterinary inspection is of vital importance.

Veterinary Dairy Inspections

A veterinary dairy inspection consists of an investigation into the sanitation of the dairy and all the parts, equipment, employes, methods of operation, and products thereof, and into the hygiene and health of the dairy animals.

It is contemplated that the milk supply for troops be, if possible, from animals which have successfully passed the intradermic and ophthalmic tuberculin tests as recognized and conducted by the Department of Agriculture, in cooperation with the various states, under the accredited tuberculosis-free herd system.

The highest standard dairy inspection procedures adopted by state and municipal services are applicable in the military establishment, and the sanitary and pathological defects and conditions warranting rejection of dairy products from unsuitable sources, for the civilian population, apply with equal force as far as the military forces are concerned.

In dairies operating on military reservations, the military authorities have jurisdiction over the operation of the plant; the testing for tuberculosis and infectious abortion, as well as control measures for other pathological conditions or sanitary defects. In the case of dairies located elsewhere, if it be impossible to secure the cooperation of the operators in correcting deficiencies, the products from such sources may be excluded from the supply for the troops. In connection with food hygiene activities experiences have been encountered which point to the necessity of the Army Veterinary Service taking adequate precautions to prevent the possible infection of man with organisms of the infectious abortion group through the consumption of animal food products, especially milk. That such possibility is actually real is indicated by the fact that since 1921 eighteen cases of undulant type of fevers have been recorded in the military service. Half of this number occurred at stations along the Mexican border and were presumably true cases of Malta fever due to the melitensis type of organism. Of the nine other cases one was due to the melitensis type of bacillus and resulted from a laboratory infection, whereas the remaining eight were due to the abortus (bovine or porcine) type of organism. It is of interest to note that of these latter cases four occurred at Fort Riley, Kansas, where a badly infected dairy herd was maintained and where infectious abortion was prevalent also among hogs.

Amount of Products Inspected, Rejected, and the Causes for Rejection

The following data have been extracted from the *Report of the Surgeon General* for the fiscal year ending June 30, 1928, and refers to inspection activities during the calendar year 1927, in which period there was a total of 138,878,909 pounds of products inspected, of which 137,998,187 pounds were passed and 880,722 pounds rejected. This represents a rejection of 0.63 per cent for the five classes of inspection—products inspection prior to purchase, products inspection on receipt at purchase, inspection on any receipt except purchase, inspection in storage and inspection at issue to troops.

Considering the products passed, the greatest amount of inspection occurred on receipt at purchase—51,482,821 pounds; 51,142,083 pounds were inspected at issue; 14,998,763 pounds in storage, and 11,773,054 pounds on receipt other than purchase.

In some instances all the inspection procedures were performed by the Army Veterinary Service, and included antemortem and postmortem inspection prior to purchase, in which case totals were reported in carcasses instead of pounds, and were as follows: 1,360 beeves, 118 calves, 3,025 hogs, 2,150 chickens and 1,024 turkeys. Rejections totaled 33 beeves and 2 hogs.

Of the 880,722 pounds of products rejected during the year 1927, 858,060 pounds (97.40 per cent) were rejected prior to purchase and returned to the contractor for replacement, while only 22,662 pounds (2.60 per cent) were rejected after purchase and lost by the government.

The more common causes for rejection before purchase, and listed in the order of importance, were: noncompliance with specification requirements, bruises, contamination, slimy condition, leakers and swellers (in the case of canned products), mouldy, sour, diseased and deteriorated condition.

The five products among which the greatest amount of rejections were made before purchase were, in order of importance: beef (fresh and frozen), butter, turkeys (fresh and frozen), hams (sugar and dry-cured) and bacon (issue).

The five products showing the greatest number of rejections after purchase were, in order of importance: milk (canned), beef (fresh and frozen) and butter.

In contrast with these peace-time activities of the inspection service, it is interesting to note that during the war-time years of 1917-1918, when the larger part of such supplies were secured by the Chicago depot, the veterinary service of that center provided inspection for approximately one and one-quarter billion pounds of products. This work was accomplished without a semblance of the difficulties which attached to the procurement of meat foods during some of the previous wars.

The foregoing figures indicate a high degree of vigilance on the part of the inspection service, and present a striking illustration of the sanitary and economic importance of Army veterinary inspection.

Discussion

Chairman Kelser: Of course, you all recall that back in the days before the Veterinary Service of the Army was developed to the point where it now is, we had the "embalmed beef" situation, and considerable criticism of the food supply service, in a war that was in no way proportionate in size to the last war. But in the last war, as Colonel Musser pointed out, with the enormous amount of meat food products inspected by the service, there was absolutely no criticism of it and, as a result of that, the former Director of the Veterinary Corps, Colonel Morse, was decorated by the American government, rather

than having him up before a court martial because of some situation similar to the "embalmed beef" condition.

There is one thing that stands out in connection with Army meat inspection service that differs somewhat from that in civil service, and that is, in the military establishment it is really a series of re-inspections. The meat, even though it becomes government property, is inspected every time it moves, whether it be from one station to another or whether it be from a warehouse to a troop organization, so, actually, it is inspected up to the time of consumption. That, of course, is exceedingly important, where you are dealing with large masses of men and where the food supply might incapacitate an entire army if the conditions were not right.

Of course, as Colonel Musser pointed out, the government is very careful to see that specifications are complied with and that food products are in good shape before purchase and have all the indications of good keeping quality, in order to save the government financial loss in the event large quantities have to be rejected after the food goes into storage.

That applies, particularly, to some of our food preparations, such as butter, lard, and so forth, which, if bought after they are of some age, might take on a rancid condition, and so forth, and be cause for rejection after the government has purchased them.

DR. A. E. BEHNKE: The impression that I received from Colonel Musser's talk is that the Army accepts the inspection of the United States Bureau of Animal Industry, where this inspection is available, but if, at such places where the products that the Army purchases, the United States Bureau of Animal Industry inspection is not available, then the inspection is made by the inspectors of the Army.

Now, there is a question I would like to ask: When they make purchases and receive meats which bear the brand of the United States Bureau of Animal Industry, is a re-inspection made immediately upon receipt at the Army posts?

LT. COL. MUSSER: As I understand the question, Dr. Behnke wants to know whether we carry out our regular inspection in cases where we receive supplies of this nature bearing the Bureau stamp? We, naturally carry the inspection right through; and that is without any reflection on the Bureau, of course. I tried to explain, briefly, in my paper, that we accepted the Bureau findings as far as they applied; and that, in a general sense, is true, because we attempt to purchase supplies that have had Bureau inspection and we accept your antemortem and postmortem inspections and carry out our inspection procedures from that point on. And, when supplies are received under conditions such as you spoke of, why, of course, the antemortem and postmortem inspections have been attended to and our inspection then, on receipt, is essentially one which concerns quality and condition, and the sanitary requirements.

DR. BEHNKE: Well, do you then make a re-inspection of the product? Of course, it is a product inspection, necessarily, but do you make a re-inspection on receipt of the products that come with the Bureau stamp?

LT. COL. MUSSER: Yes, because your inspection, as far as the Army is concerned, is not one which concerns quality. In other words, you pass on the wholesomeness of the product, but, as far as it being of a particular quality which would be available to the Army, you do not concern yourselves with that, of course, and we are concerned, in that we have our specification requirements governing the purchase of these supplies and our inspection, of course, is applied to these products, regardless of whether they come in bearing the Bureau stamp. We are always hoping that they do bear the Bureau stamp. But we subject them to the regular routine inspection, and that would be after your inspections. It would be, as I say, for quality, condition and sanitary aspects.

CAPT. C. E. COOK: I would like to illustrate this condition that has been brought up, and make it a little clearer. I remember a few years ago I was at a station where we got meat rather irregularly, and rather in an out-of-the-way place. I received a quarter of beef one day that had been inspected by the Bureau of Animal Industry and, undoubtedly, was perfectly all right at the time of inspection, but, apparently, this had been carried beyond our station; it had been out a long time and, besides being deteriorated a great deal from

being hauled around on a railroad train, apparently had been loaded with some poultry some place, and it was a very filthy piece of meat.

That illustrates why we must carry on our inspection at receipt, even though there has been an inspection by the Bureau of Animal Industry, because so many things may happen between the two inspections.

DR. J. C. FITZGERALD: In the supply of milk and milk products to the Army, do you require, if it is purchased outside, that the milkers and dairy attendants be inspected for tuberculosis, periodically, by the medical staff of the Army, or by a civil medical staff?

LT. COL. MUSSER: That is a requirement which we try to have observed as far as possible. It is a phase of the work which is taken into consideration, I think, always, by the medical officers and by the veterinary officers and they try to have those requirements observed as far as possible.

In other words, we try to have our inspection service compare favorably with the highest standards accepted in civil life. And, of course, those requirements apply in civil life and we try to have our service on an equally high plane. It is not always possible to bring that about, but it is the end we try to attain.

DR. BEHNKE: Is there a larger percentage of milk furnished to the Army as the canned product? As evaporated milk, in considerable quantity?

LT. COL. MUSSER: We use a considerable quantity of canned milk, particularly in the tropics. In certain foreign possessions they have virtually no fresh milk supply at all. That is particularly true in the Philippines, where there is virtually no supply of fresh milk and the small supply which is available, in my experience, is not acceptable under Army standards. So we use canned milk altogether, as far as the troops are concerned. I presume there were a few families who probably went out on their own and indulged in these local products, but, essentially, as far as the Army is concerned, we use canned milk entirely.

Now, Captain Cook, who has recently returned from Panama, probably can tell us about the situation there. I am not familiar with the situation in Panama or in Hawaii. Probably Dr. Fitzgerald can tell us about it there. I have never been stationed in those places. What I have told you, Doctor, applies in the Philippine Islands. But, of course, in the States there are large quantities of canned goods used, and that is particularly true when the troops are in the field.

CAPT. COOK: Mr. Chairman, the milk supply in Panama is about as the Colonel has outlined in the Philippines, except that they have one rather large dairy, conducted by the Panama Railroad Company, which is a government agency. They are not able to supply milk in any large quantity but they do supply milk for hospital patients and for children, and that is obtained through a prescription from the surgeon. The milk supply from this dairy is quite good and that is inspected first by veterinarians employed by the Health Department of the Canal Zone. But, as far as the troops are concerned, they use the canned milk entirely, both at the stations, the posts, and in the field. Then, there are a few private dairies conducted in the Canal Zone and those dairies also are supervised as to sanitation by the veterinarians employed by the Health Department of the Canal Zone.

DR. A. J. SIPOS: Are those animals tested in the Canal Zone?

CAPT. COOK: All animals are tested in the Canal Zone. There are only two towns of any consequence, Colon and Panama, and while they are Panamaian towns, under the Panamaian government, the health and sanitation is supervised by the Health Department of the Canal Zone and the Health Department is headed by a medical officer of the Army.

But the dairies that are on the outside, that bring milk into the Canal Zone, are supervised by the Health Department and are tested annually by the veterinarians employed by the Health Department of the Canal Zone. I might say that they have but very little tuberculosis in Panama; very, very little.

CHAIRMAN KELSER: Do they have many dairy herds in Hawaii, Dr. Fitzgerald?

DR. FITZGERALD: Regarding the milk supply of the Army in Hawaii, I really do not know definitely about it. I think, as Captain Cook has said, the

chief supply for the enlisted personnel is canned milk. The officers and their wives have a fresh supply from a dairy which is a very modern dairy.

Our Board of Agriculture and Forestry regulations are that cattle be retested every six months and that in herds where a reactor is found that they be tested again in ninety days. This testing started in the year 1907, under the supervision of the late Dr. Victor A. Norgaard. He was the pioneer in the work, and in our early days we used to get—I was working with him at the time—anywhere from twenty to thirty reactors in our dairies. Today, we have it down quite low—it varies a little; once in a while, we get a slip somewhere. I had an occasion once, where a tuberculosis sanitarium, instead of incinerating the dressings, had been carelessly throwing them out and the person who was in charge of that work had evidently forgotten to burn them and they were blown in the pasture and, in a perfectly clean dairy, a dairy that had been tested every six months and had shown no reactors for six years, I found twenty-eight reactors on the first test and, on a further test, in three months, I got another eleven out of it. We did a lot of research work in the matter and proved almost conclusively that it was a human type of infection that had come from these soiled dressings.

But what I was going to say is this: After the testing has been done by the dairies, the inspection of dairies is carried on by the Board of Health, that is, the dairy premises, the refrigerators and milk-rooms, and that sort of thing.

There are two or three really very high-class dairies now organized, and they are supplying grade A raw milk and, at each of those dairies we have asked the men, as a personal favor, to have all their laborers who come in contact with the milk in any way, sent to a medical man to be examined about every three months, so that if a man has any trace of tuberculosis he can be eliminated from the dairy work; looking upon that as one of the principal causes of contamination of milk supplies.

BUREAU TRANSFERS

Dr. W. R. McCall (Chi. '13), from Spokane, Wash., to Sandpoint, Idaho, on meat inspection.

Dr. W. F. Osborn (K. C. V. C. '08), from Baltimore, Md., to Newark, N. J., on meat inspection.

Dr. F. J. Scheloski (K. C. V. C. '11), from Chicago, Ill., to Knoxville, Tenn., on meat inspection.

Dr. F. F. Meads (Gr. Rap. '11), from Detroit, Mich., to Oskaloosa, Iowa, on meat inspection.

Dr. W. H. Meadors (K. C. V. C. '00), from Birmingham, Ala., to Atlanta, Ga., on meat inspection.

Dr. R. N. Ashley (K. C. V. C. '08), from Reno, Nevada, to Los Angeles, Calif., on meat inspection.

Dr. H. M. O'Rear (Ind. '12), from Nashville, Tenn., to Washington, D. C., on tuberculosis eradication.

Dr. W. B. Lincoln (Iowa '93), from Nashville, Tenn., to Morristown, Tenn., in charge of meat inspection.

Dr. Hugh L. Fry (U. P. '09), from Little Rock Ark., to Nashville, Tenn., in charge of tuberculosis eradication.

Dr. Lawrence Lewis (Chi. '09), from Clarkville, Texas, on tick eradication, to South St. Paul, Minn., on meat inspection.

MUNICIPAL MEAT AND MILK INSPECTION*

By H. B. MITCHELL, *Lancaster, Pa.*

In presenting a paper on municipal meat and milk inspection, one who has been engaged in that line of work is prone to dwell too much upon the local angle; therefore, it shall be the purpose of the writer to make only such references as will aid in bringing to your attention a general view of the entire subject.

Milk Inspection

If we visit any municipality where the milk supply is not under supervision, where the cattle of the surrounding territory have not been tested for tuberculosis or where there has been no press agitation for improved methods of handling milk, we will find that the existing conditions simulate those found at Lancaster. All milk will come largely from herds which have not been tuberculin-tested. Farms will not have milk-houses, stable sanitation will be bad and cows will be unclean.

Raw milk will be bottled in cellars, kitchens and stables and no provisions will be made at these places for sterilization of bottles, cans and utensils. Cooling and storage of milk will be neglected, bottles will be capped by hand and no protection against flies will be found. Modern equipment to insure pasteurization of every particle of milk will not be in use.

ORDINANCES

All milk ordinances should be broad enough to correct these conditions and in most cases will have to be designed to take care of specific problems of city, borough or township.

With reference to source and grade of milk sold, there exist two types of ordinances:

1. An ordinance requiring that all milk shall come from tuberculin-tested herds, prescribing methods for pasteurization of milk and giving conditions under which the sale of raw milk will be permitted.

2. An ordinance requiring that all milk sold raw shall come from tuberculin-tested herds and that all other milk shall be pasteurized.

A recent study of 2,112 ordinances made by the United States Public Health Service and the Bureau of Dairy Industry revealed that 1,557 of these had the tuberculin test requirement.

*Presented at the sixty-sixth annual meeting of the American Veterinary Medical Association, Detroit, Mich., August 13-16, 1929.

Enforcement

The tuberculin test of cattle was considered our first problem, as Lancaster's ordinance contained this requirement for all milk.

About 5 per cent of the herds supplying milk had been tested previous to July 1, 1925, and the Pennsylvania Bureau of Animal Industry had estimated that the number of cattle infected with tuberculosis would run from 20 to 30 per cent. The State was unable to assign immediate tests and out of fairness to everybody it was thought that we should accept the milk from herds whose owners had filed applications for test. The Board of Health passed a ruling to this effect and on January 1, 1926, when the ordinance was to become effective, we had obtained the necessary applications.

During the spring of 1926, two townships were tested in Lancaster County on an area basis and showed about 60 per cent infection, with 25 per cent condemnations. Simultaneously there arose in Chester County an antagonistic movement against the tuberculin test and as Lancaster County had always fostered some individuals who opposed anything progressive, this was fertile soil for the growth of an anti-tuberculin test organization. Lancaster's ordinance was likewise opposed and, on July 26, the court granted a temporary injunction restraining the city from cancelling the licenses of two distributors whose farmers had withdrawn their applications. The late Judge Hassler, in an opinion, ruled that the Board of Health had made a regulation which was new legislation, was not consistent with the ordinance and that said regulation requiring tuberculin test or application for test was therefore void.

On October 30, the city was enjoined from cancelling the licenses of dealers not selling milk from tested herds. These licenses expired December 31, 1926, and at that time the city was again restrained from enforcing the ordinance. On March 5, 1927, Judge Landis handed down a decision in local court which sustained the ordinance. An appeal from this decision was immediately taken to the Pennsylvania Supreme Court and, on May 9, this decision was upheld by that august body. During this legal affray there were issued by the court 54 temporary injunctions restraining the enforcement and questioning the legality of the ordinance, all of which were dissolved on May 25. Up to this date, there had been approximately 300 herds tested in Lancaster County and the balance of our milk

was obtained from nearby counties. On May 27, 1927, the city of Lancaster received a complete supply from tuberculin-tested herds and today no bottling-plant is allowed to receive any milk from untested herds.

Plant Improvement

The next project to receive attention was plant location and equipment and today we do not have a man bottling milk who does not have a well-located dairy-house, with at least three separate rooms; a boiler-room, a wash-room and a room for handling milk. To protect against flies the milk-room has no outside entrance, screens and self-closing doors are also required. All distributors have steam boilers and some means of steam sterilization for their bottles, cans and utensils. Where can-washers are not used, metal can-racks are installed. Raw milk is delivered to bottling-plants twice daily during warm weather and covered tubular coolers are required so that milk may be immediately cooled to 50 degrees Fahrenheit or lower. Flush valves and recording thermometers are a part of all pasteurizing equipment. Bottles cap are purchased in tubes and mechanical cappers used. The producer and distributor are constantly advised of the importance of cleanliness, efficient cooling and sterilization of bottles and utensils.

Farm Improvement

Our farm project for this year has been educational. An attempt has been made to have every farmer build a milk-house, sufficiently large and convenient enough to his barn to permit its use for the straining of milk. Sanitary strainers with single service pads are required. Troughs for cooling and storage of milk are provided and to permit the storage of utensils and prevent fly contamination, metal racks are installed and windows screened.

Other changes which gradually take place on farms are concrete floors in stables, better lighting, better ventilation and tight ceilings. Stables should be cleaned at least once daily and manure should not be allowed to accumulate on the flanks and udders of cows.

Results

In July, 1925, there were 54 places bottling milk for Lancaster and today we have but 35, eight of which are on farms.

No attempt was made to improve plant conditions until January 1, 1928, and during the four years previous to this time, the average estimated bacterial count of all samples of milk taken from wagons, on the streets, was 466,750. For 1928 the average count of 800 samples was 94,700, or a reduction in one year of nearly 80 per cent. The count for the first seven months of this year is about 20 per cent lower than for a like period last year.

The average fat content of our milk has increased from 3.6 per cent to 4 per cent and there has been a slight increase in consumption.

Deaths of children under two years of age, which could be attributed to intestinal and dietary conditions, decreased during 1928 and but 2.2 per cent of the deaths of children of like age were attributed to tuberculosis while for the two previous years this percentage was placed at 6.

Conclusions

The ultimate results of any milk ordinance should be a milk supply so protected that the possibility of a milk-borne epidemic is practically removed. Milk for pasteurization should be of the best quality possible and milk that is sold raw should approach the quality of certified milk and be as rigidly protected. These ideals will not be reached in a single year but should be the goal for all milk inspectors.

As it has been definitely concluded that bovine tuberculosis is transmissible to man, with the known human error that may occur in our methods of pasteurization and with the present progress and large appropriations made for the eradication of tuberculosis from cattle, all ordinances should include the tuberculin test clause.

Our methods of control have been largely with plate count on bottled milk and milk from farms for raw plants. In checking on milk for pasteurization, the methylene blue or reductase test is of decided advantage, giving prompt results and requiring little effort in application. It seems, however, that we should not rely alone on bacterial estimates but should combine these with keeping quality and freedom from visible dirt, and grade our milk on a percentage or total score basis.

In the enforcement of any milk ordinance you will find many reluctant people who make progress necessarily slow. The results obtained will depend largely upon the individuals of a

community and their susceptibility to education along lines of better milk-handling. Not many cities will have the legal difficulties that Lancaster had and for that reason may secure their requirements far more promptly. The enactment of state-wide milk laws, such as now being tried in Pennsylvania, even though requirements are of a minimum character, should strengthen municipal ordinances and make the task of enforcement easier.

The personnel employed to enforce milk ordinances should be familiar with all phases of the milk industry and no man is better trained for this work than the veterinarian. If employed he should be on full time and if the town desiring protection is too small to pay his salary, better results will be obtained by making a unit of several towns or townships. We have many examples where a city or town employs a man on part time to do milk inspection, and so few hours are given to the work, that it is entirely neglected and not only does our profession suffer thereby but the municipality is not getting value received.

Meat Inspection

A survey of our cities and towns will reveal that municipal meat inspection is maintained in fewer places than milk inspection and its importance seems equally great.

No doubt a majority of our butchers would not knowingly sell diseased or stale meat yet with the prevailing high prices of cattle, hogs and sheep there is admittedly a decided temptation for a man to recover his money, once an investment has been made.

It has been found that a majority of butchers and especially those who want to give the public quality meats will favor inspection. In this way unfair competition in cheap, diseased meats will be avoided. The people will then get meats which are not questionable and as this becomes known consumption will be increased.

Today the public is not generally informed on the inspection of meats and when they occasionally read of federal and state meat inspection the majority gain the impression that all meats are inspected. Pennsylvania perhaps does not differ from other states in this respect. With a consumption of 1,500,000,000 pounds of meat annually, one-third, or 500,000,000 pounds, is sold without inspection.

The city of Reading, Pennsylvania, during the first year of inspection, condemned 150,000 pounds of meat as unfit for

human consumption. Lancaster County hogs show as high as 20 per cent infection with tuberculosis in certain lots.

Butchers are not trained to recognize diseased parts and, without inspection, glandular infection with tuberculosis will not be detected and the adjacent parts will be used for food.

A municipal meat inspection ordinance should embody the federal rules and regulations with reference to meat inspection and although fees should be moderate, it is advisable to place the burden of inspection largely upon the industry.

Again a well-trained inspector is required and a graduate veterinarian is the only man so specialized in animal diseases as to be able to pass upon the fitness of a carcass for human consumption.

DISCUSSION

DR. J. B. HOLLINGSWORTH: I was very much interested in Dr. Mitchell's paper. In Ottawa, Canada, our dairy cattle are all tuberculin-tested and ninety-eight per cent of the milk is pasteurized. We have an ordinance there requiring that the bacterial count of milk sold raw must not exceed 30,000 per cubic centimeter. All the dairy farms are supplied with boilers and refrigerators. We sometimes have them jump a little higher than 30,000 but we try to keep them down to that point or lower.

In connection with the meat inspection in our city, we had thought, at one time, of having a municipal abattoir established, where all meat that was not inspected by the federal authorities could be examined. That was put to a vote of the people and carried in every ward.

We found, however, that we had no power to force the farmers to bring their live stock to a central slaughter-house and have them slaughtered, so that was abandoned. But we put in force another regulation—that all meat sold in the city had to be inspected, with the heart, lungs and liver held by their natural attachments to the carcass.

This meat is brought to our central examination plant in the city and we have two veterinarians there who do nothing else but examine this meat and stamp it, "Ottawa approved" or "Ottawa inspected."

We do not have, as Dr. Mitchell stated, at all times, clear sailing in our city. We have opposition from the milk producers along different lines, if we want to get something going.

The herds are tested for tuberculosis by federal authority, under the new tuberculosis order. Compensation is paid.

We met with great opposition, but we finally got them, one by one, to fall in, until we got the majority of the herds tested and then we made the rest follow. But they are tested regularly and our milk is pasteurized. We would like to see one hundred per cent of our milk pasteurized. Clean milk; good healthy cattle and, as an extra safeguard, the milk pasteurized.

Covering the Field

A recent issue of the *Bloodless Phlebotomist*, published by the Denver Chemical Manufacturing Company, of New York City, has been mailed to every English-speaking physician in the world with a known address. In addition to the English edition, this issue was printed in French, German, Spanish, Portuguese, Italian, Chinese, Japanese, and Hungarian, with a total circulation of over 1,250,000 copies.

FEDERAL INSPECTION OF LIVE AND DRESSED POULTRY*

By L. D. IVES, *New York, N. Y.*

Senior Marketing Specialist, Bureau of Agricultural Economics, United States Department of Agriculture

Up to the year 1926, there was no official inspection of live poultry entering New York city markets. In the fall of 1924, the European fowl pest was found in some shipments of live poultry that originated in the western states. As a result of this, quarantines and embargoes were placed upon poultry from eleven western states, resulting in heavy losses to shippers as well as to receivers of live poultry.

After the eradication of fowl pest infection, the Health Department of the City of New York influenced the receivers of live poultry into forming an inspection service, so that unfit poultry might be eliminated before being sold to the various retail slaughter-houses.

This private inspection service functioned for about a year and a half but the authorities could not control all of the poultry arriving in New York, since there was no law or regulation which required this inspection, but in October, 1926, a city ordinance was passed requiring that all live poultry entering the city of New York for sale or distribution must be inspected by some agency acceptable to the Board of Health.

A federal law had previously been enacted authorizing the establishment of an inspection service for perishable farm products by the Secretary of Agriculture and it was decided by those in authority that this agency would be the one best adapted to perform this service. Therefore, in November, 1926, an agreement was entered into between the Greater New York Live Poultry Chamber of Commerce, the New York Live Poultry Commission Merchants' Association and the Bureau of Agricultural Economics, whereby the Joint Inspection Service on Live Poultry was inaugurated, approved by the Board of Health and, since that date, has functioned continuously as the official live poultry inspection agency. Recently this service has operated under an agreement between the New York Live Poultry Com-

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mission Merchants' Association and the Bureau of Agricultural Economics.

The personnel of the Live Poultry Inspection Unit at present is composed of three veterinarians and nine laymen, whose duty it is to inspect each individual shipment of live poultry, whether arriving by express or freight, before this poultry can be released for sale.

The inspectors arrive at the different railroad terminals each morning before 8:00 a. m., checking up on the number of cars available for the day and reporting this information to the office. When the applicant believes that his car is ready for inspection, he applies to the inspector in writing, on a regular form, indicating the number of the car which he desires inspected and the location in the yards. The inspector then proceeds to the designated car, where he first secures from the carman certain information relative to the shipper, point of origin, days in transit and the particular kind of poultry in the car, after which, he proceeds to inspect from 100 to 200 individual birds in the different parts of the car, to ascertain the weight of the crop contents and health of the birds.

There are 128 layers or decks in each car, containing on an average 30 to 35 adult birds, the car as a whole containing about 4,000 birds.

Restrictions on Crop Weight

The health regulations permit only fowl and other larger classes of poultry with a crop weight of 2 ounces or less to be sold and in the case of broilers weighing under two and one-half pounds each, a crop weight of one ounce or less. Therefore, a separate inspection is made of fowl and broilers and separate averages obtained. Ducks and geese are examined for health and wet plumage.

The weight of the crop is determined by allowing it to rest loosely in the palm of the hand and once the inspector gets the idea of the volume and weight of a two-ounce crop fixed in his mind, all other weights are gauged by that standard, either below or above.

While making the inspection for crop weights an inspector examines the feed in the troughs for evidence of prohibited substances, viz: gravel, sand, oyster shells. wheat, flour, etc., which may cause the rejection of a car even though the poultry was not overcropped. We are told that, prior to the establishment of this inspection service, poultry had an average of eight ounces of feed in their crop, while now it cannot be above two ounces.

The sanitary condition of poultry cars is not the best, due to the great number of birds crammed into the layers for from three to ten days, depending upon the distance of travel. Birds in good health should make the trip of a week without much loss. Birds in poor health die en route.

During the molting season and in cold weather poultry is apt to get chilled and easily becomes infected with any contagious organisms which may be present. Diseased and weak poultry is easily located, as a rule, by the inspector, in the corners and in the back part of the layers, being forced there by the healthier birds.

The inspector is guided in the detection of sick birds also by his sense of smell, as muco-purulent discharges produce odors which are peculiar to respiratory diseases. All birds which show outward visible symptoms of disease or are emaciated and which are considered unfit for human consumption are removed and destroyed.

Rejected Poultry Destroyed and Denatured

All poultry rejected by our inspectors is immediately destroyed and denatured. The coops which are used for transporting poultry from a car containing an infectious disease are marked for identification and returned to the coop company's yards for cleaning and disinfection before being used again. The car from which such diseased poultry is removed is placarded and ordered to a special cleaning depot where it is cleaned and disinfected under the supervision of B. A. I. inspectors.

Roup and infectious bronchitis are the principle diseases with which we have to deal. These diseases begin to show in poultry arriving from the West about the middle of August and continue to increase in amount until the peak is reached in January, when they begin to subside until they gradually disappear during the latter part of March. Other diseases and conditions which we find are fowl cholera, fowl typhoid, tuberculosis, emaciation, limberneck, paralysis, etc.

In winter months the greater part of our poultry arrives from Missouri, Illinois and Indiana, and in the summer months from Tennessee and southern states.

A certificate is issued in duplicate by the inspector on every lot of poultry inspected. This certificate is receivable in all courts of the United States as prima facie evidence of the truth of the statements therein contained. The original is given to the appli-

cant and the duplicate mailed to the office from which such additional copies as are needed are typed, one of which is mailed to the shipper.

The transportation companies appeal to us daily for copies of certificates on certain cars which the shipper has made claim for losses in transit. This has no doubt lessened the claim abuses which formerly existed.

The co-operating organization guarantees the full cost of this inspection service. Regular fees, as stipulated in the "Rules and Regulations of the Secretary of Agriculture Governing the Inspection and Certification of Live Poultry," are collected for this service. The authorized fee is $5.00 per car for poultry arriving by freight and two cents per coop (of 40 or 50 lbs.) of poultry arriving by express. The total amount of poultry arriving by freight and express in New York averages about 1,000 cars per month.

Now, in case the receipts are not sufficient to meet expenses the cooperating organization, by the terms of the agreement, is required to supply the deficiency. The personnel of this service is licensed by the Secretary of Agriculture, after recommendation of the supervisor that each inspector is competent and reliable. These licenses may be revoked also if it is shown that the holder is incompetent or violates the regulations of the Secretary of Agriculture.

Salaries Received by Inspectors

The lay inspectors employed in this work receive from $2600 to $3200 a year salary, and the veterinary inspectors from $3,000 to $3600 a year, depending upon their degree of efficiency and interest in the work.

In February, 1928, a large soup manufacturing company, desiring to export their chicken products to Canada, applied to the Secretary of Agriculture for certification of their products, since the foreign country would not accept the American goods unless they were inspected by the federal government. Therefore, the Secretary of Agriculture promulgated regulations governing the inspection of dressed poultry for condition and wholesomeness. The Chief of the Bureau of Agricultural Economics issued instructions governing the disposal of diseased poultry carcasses and an agreement was made between the cannery and our co-operating organization, whereby this service was made possible.

Since that date, we have inaugurated inspection in eight other poultry canneries in the East and one chain restaurant. One of these is a squab cannery. The same standard of sanitation and equipment is followed as that approved by the Meat Inspection Service of the Bureau of Animal Industry.

When applying for federal inspection of poultry products, the applicant must agree to submit to the regulations of the Secretary of Agriculture, to pay the full cost of the service, which includes the salary of the inspector, the expense of the supervisor in making his official visits, plus one ninth of the total cost, to help carry the overhead cost of the inspection service. The regulations require that only graduate veterinarians may be employed in this work.

The reason that these establishments are required to enter into an agreement with some outside agency is the fact that moneys paid direct to the United States would not be available to defray the expenses of the service.

B. A. I. Procedure Closely Followed

The technic of our inspection follows very closely that used in the B. A. I. The poultry as a rule is received in a frozen condition, which must first be defrosted in large tanks of water, after which the birds are individually singed and placed in a tray on a moving-top inspection-table. An attendant cuts the skin between the legs and the abdomen, breaking down the legs so that the bird sets firmly on the pan. A circular incision is then made in the abdomen and the breast forcibly raised, breaking the back, when all of the internal organs are plainly visible. As these birds go by the inspector they are examined and if found fit for food are allowed to pass, but if found diseased, they are removed from the table and placed in condemnation cans and later denatured.

After the birds pass the inspector, they continue to the end of the table to a chopping block, where head and feet are removed. They then are passed to a moving-top eviscerating-table where women employees take the birds from the moving section to a stationary section, where they are eviscerated and placed back on the table to be carried to the washer.

Inspectors become very proficient in their examinations and may inspect up to 600 birds per hour. We have at present eight veterinarians assigned to these plants on full time and their entire salary is paid by these establishments. We have recently estab-

lished inspection in the West, with Chicago as a base and this unit is developing much faster than our New York territory.

Up to July 1, we had examined more than 10,000,000 pounds of poultry, respresenting over 2,500,000 individual birds. Sixty per cent of our condemnations are for tuberculosis and 40 per cent are for other causes, which include decomposition, septicemia, emaciation, tumors, salpingitis and leukemia, in the order named. In plants where cocks are used only, we find the percentage of tuberculosis very low. In well fatted No. 1 young fowl, it is also low, but heavier in second-grade old fowl and very heavy in No. 3 old fowl.

In the inspection of poultry, we find a very interesting condition, entirely different from any other food animal, and that is in the primary seat of infection of tuberculosis.

Our records show that in the cases of tuberculosis found, nearly 99 per cent show lesions in the spleen, a somewhat smaller percentage in the liver; the percentage decreasing rapidly in the number of lesions found in the intestines, ovaries, kidneys and only very seldom in the lungs.

Doctor Merillat in New Role

Dr. L. A. Merillat, of Evanston, Illinois, has joined the large number of prominent veterinarians who are identified with various commercial enterprises in this country, having relinquished his editorial chair with the *North American Veterinarian*, January first. Dr. Merillat is now associated with his son, in a general export business, in Chicago. He has also joined the well-known firm of Haver-Glover Laboratories, of Kansas City, Missouri, as Vice-president, in charge of the Chicago branch, at 569 West Van Buren Street.

Corn States Needle

Number one of volume one of *The Corn States Needle* has made its appearance. It is the house organ of the Corn States Serum Company, of Omaha, Nebraska, and is to appear monthly. The first number contains an editorial entitled, "There Is No Substitute for Satisfaction," by the President of the Company, Mr. G. H. Williams, that explains why so many veterinarians throughout the country have a good word for "Corn States." Dr. L. A. Merillat contributes an article, "Premature Births," in the initial number, which consists of sixteen pages, "short and pointed."

THE LESIONS PRODUCED BY THE JOHNE BACILLUS OF DISEASE IN THE PERITONEAL CAVITY OF THE GUINEA PIG*

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During the last several years we have inoculated guinea pigs from time to time with cultures of the bacillus of Johne's disease and with suspensions of cattle tissues which were rich in this bacillus. These animals have never shown the slightest symptom as a result of the injections. They were sacrificed for autopsy at varying times after inoculation, some as early as three weeks and others as late as six months. Those inoculated intramuscularly have regularly been free of disease but a few of those injected subcutaneously and practically all of those injected intraperitoneally have shown rather characteristic lesions. The subcutaneous injections have been made in the middle of the abdomen and it is possible that occasionally the needle may have pricked through the abdominal muscles and allowed some of the fluid to escape into the peritoneal cavity. Either this has happened or in occasional instances the bacilli have been able to pass through the abdominal wall into the cavity, for the lesions found have always been in the peritoneal cavity.

The lesions referred to were found in greatest number and of largest size in the great omentum, particularly near its free margin. In many male animals lesions were found in the scrotal sac. Occasional small lesions were found on the diaphragmatic surface of the liver, on the surface of the spleen or upon the surface of the intestine.

The lesions in the omentum consisted either of nodules or of diffuse thickenings. The new tissue was rather pinkish in color and quite firm. The nodules varied in size from pin-points to 6 or 8 mm. in diameter. The diffuse thickenings were sometimes several centimeters in length and nearly a centimeter thick. In some cases only a few nodules were present; in other cases there

*Presented at the sixty-sixth annual meeting of the American Veterinary Medical Association, Detroit, Mich., August 13-16, 1929.

were a dozen or more of varying size. In occasional cases practically the whole omentum was converted into a thick fleshy mass.

In some cases the new tissue presented no visible evidence of necrosis but usually the larger masses showed opaque yellowish

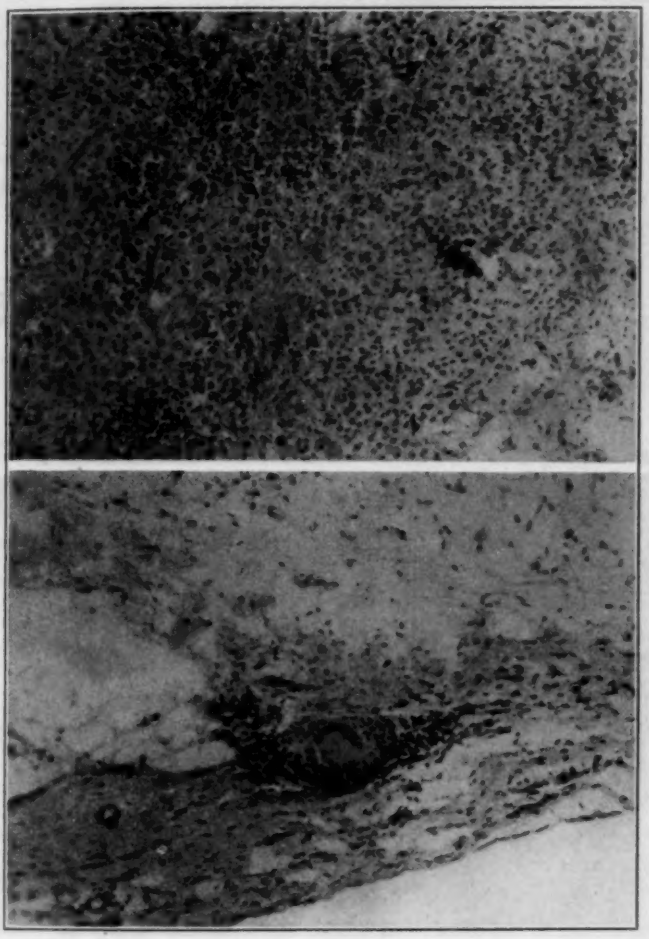

FIG. 1. (Above) Section of thickened omentum of guinea pig due to the bacillus of Johne's disease. Tubercle-like granulation tissue. The principal cell is the monocyte. Many of these contain acid-fast bacilli (not stained in this section).
FIG. 2. (Below) Minute lesion in omentum of a guinea pig due to bacillus of Johne's disease. Several epithelioid cells and one giant cell are surrounded by a small mass of lymphocytes.

white areas which resembled necrotic foci. In one or more of these spots fluid pus, yellowish in color and butyrous frequently existed and exuded when the lesion was incised. Ordinarily this pus showed acid-fast bacilli, sometimes in enormous numbers. This

was true even in lesions which were five or six months old. The new tissue frequently involved the pancreas which lies as a very elongated organ in the great omentum of the guinea pig. Usually there were no adhesions to other organs.

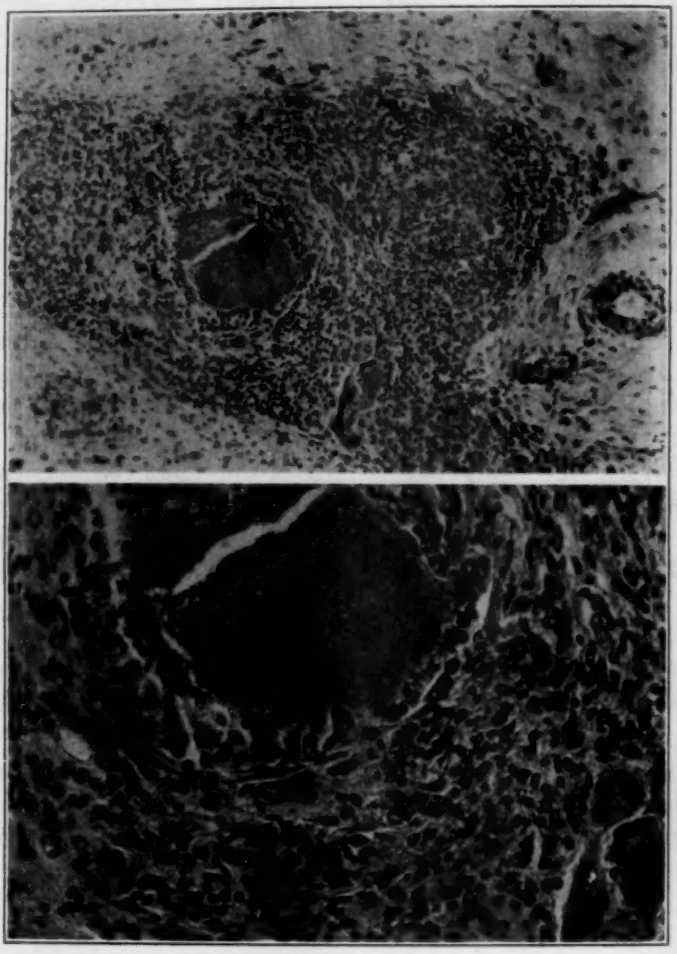

FIG. 3. (Above) Small lesion in the omentum of a guinea pig which had been inoculated four months previously with a heavy suspension of the bacillus of Johne's disease. The lesion consists largely of epithelioid cells, with a liberal sprinkling of neutrophiles and lymphocytes. The necrotic-appearing material in the center is a dense mass of acid-fast bacilli. The giant cell in the upper right-hand side also contains a mass of these bacilli.

FIG. 4. (Below) Same section as fig. 3 (higher magnification). Epithelioid cells, neutrophiles and lymphocytes may be recognized.

The lesions upon the serosa of the testicles, or upon the epididymis, took the form of firm adhesions which held the organs tightly in the scrotal sac. Generally a little caseous pus would be

found among the adhesions. In a few instances the lesions in this region took the form of pinkish-white, flat excrescences which did not cause adhesion of the organs. A few acid-fast bacilli could generally be found in smears, especially when pus was present.

Sections of the peritoneal lesions irrespective of where they were found showed an essentially identical structure. They were made up principally of masses of monocytes and epithelioid cells generally surrounded by a few lymphocytes. Among the epithelioid cells giant cells of the Langhans type were numerous. In the younger lesions acid-fast bacilli could be found in many of the monocytes. In the older lesions evidence of central softening, manifested by karyorrhexis and the presence of many neutrophilic leukocytes could be seen in nearly all nodules. In some cases collections of poorly stained material were present, sometimes as huge masses, more frequently as small masses here and there in the disintegrating central areas. When stained with the Ziehl-Neelson technic these masses turned out to be dense collections of acid-fast bacilli. Not infrequently masses of these bacilli were seen within giant cells.

Lesions of the sort just described were seen when relatively heavy doses of the Johne bacillus had been injected. When smaller numbers of bacilli were injected, similar lesions were found but these generally lacked the pus formation and the necrosis. The lesions were then not so large, nor so abundant, and the smears naturally showed fewer bacilli.

Cultures were made from a number of these lesions which were from four to six months old and which showed large numbers of strongly acid-fast bacilli of typical morphology in smears. In not a single instance did we succeed in obtaining growth of the Johne bacillus. This fact, taken together with the fact that the size of the dose injected determined in large measure the severity and the character of the lesions, led us to believe that the organism had not multiplied to any extent, probably not at all, and that the lesions were merely the result of the dead or dying bacilli which were injected. Similar lesions may be produced in guinea pigs by injection with heat-killed Johne bacilli, tubercle bacilli or certain grass bacilli. Similar conditions are likewise found in very early tubercle infection of the peritoneal cavity. Later in tubercle infection the condition becomes exaggerated due, of course, to the multiplication of the bacilli and the extension of the condition.

The production of such lesions by acid-fast bacilli incapable of living in the host in which they find themselves, and by heat-killed acid-fasts is not a surprising fact. Robert Koch,[1] in 1891, first demonstrated that dead tubercle bacilli, introduced into tissues in considerable numbers, were capable of inducing the formation of tubercles which were typical in every way except that they would not metastasize. Later it was found that the fat-like substances which are present in such large amount in acid-fast organisms acted as the stimuli for the cellular proliferation which results in tubercle formation. Through the work of Sabin and Doan[2] who have lately conducted animal experiments using chemical fractions of the tubercle bacillus prepared by Anderson,[3] we now know that there exist in the lipoids of the bacillus certain fatty acids which when injected in a relatively pure form into animals will cause the formation of new tissue resembling that produced through the activity of the living organism. Although such fatty acids have not yet been isolated from the Johne bacillus, there is no doubt but that they exist there and are the cause of the tubercle formation which has been described.

Lesions undoubtedly identical with those which we have observed were seen by Twort[4] in rabbits and by Boquet[5] in white mice and rats which had been inoculated intraperitoneally with heavy doses of the Johne bacillus. Twort reported his inability to obtain cultures from the lesions and considered that the organisms probably were dead. Boquet did not mention any attempt to learn whether or not the bacilli had retained their vitality.

There remains another fact to be explained: Why is it that the bacilli are gathered together in such masses, especially in the omentum? This is an interesting but unsolved question. If one introduces a suspension of fine carmine, or India ink, into the peritoneal cavity of the guinea pig, he will find that after a few minutes most of it has collected together in gelatinous masses which cannot readily be washed off the surface of the organs. After a few hours the greater share of the material will be found tightly adherent to the omentum, especially along its free edge. It is evident, therefore, that there is some force at work in the peritoneal cavity which tends to cause the collection of finely divided insoluble material on and in the omentum. The collection of bacteria there is merely evidence that they are relatively insoluble bodies.

The omentum has been called the "abdominal policeman." It is apparently rather a mobile organ in man and many animals and frequently is found in the vicinity of inflamed parts of the peritoneum, many times tightly adhering to operative and other peritoneal wounds, and sometimes effectively walling off suppurative areas (Harvey).[6] In its substance are certain whitish spots which are known as the "milk spots." These are collections of wandering cells which are said to have a phagocytic function. It is in these spots that tubercles are said to form because of the lodgement of cells which contain tubercle bacilli picked up from the peritoneal exudate.

Sanarelli[7] has attempted to explain the ability of the omentum to collect foreign bodies and bacteria from the peritoneal fluid as a cataphoretic phenomenon. He claims that the omentum carries a positive charge and, as a consequence, bacteria and other electro-negatively charged particles are drawn to it by the attraction of the opposite charge.

Summary

1. Peritoneal lesions, especially of the great omentum, are regularly induced by the intraperitoneal injection of the bacillus of Johne's disease in guinea pigs.

2. These lesions consist of collections of monocytes and epithelioid cells which exhibit some softening and the development of purulent foci in the older stages. Typical acid-fast Johne bacilli can usually be found in these lesions at any stage of the process; in the very young lesions contained within the monocytes; in old lesions many times apparently free and collected together into vast numbers in the softening central portions of the lesions. In lesions as old as six months the bacilli still retain their form and stain strongly with the acid-fast technic, indicating that the bacilli are very difficult to destroy.

3. Attempts to recover these bacilli in cultures have failed. It is believed that they are dead.

4. Similar lesions have been produced in guinea pigs by the intraperitoneal injection of dead Johne bacilli, dead tubercle bacilli and dead timothy bacilli.

5. The lesions do not represent actual infection of the animal, therefore, but merely the peritoneal reaction to the lipoids of an acid-fast bacillus which is incapable of multiplying in this species.

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DISCUSSION

DR. JOHN REICHEL: I would like to comment on this work a bit. It surely is a splendid contribution. Dr. Hagan referred to the work of Anderson, at Yale, in splitting up of the lipoid fraction containing the cell stimulant. I am in a position to speak about this, because our laboratories furnished the tubercle bacilli for that work. The tubercle bacilli were the human type.

What makes it rather interesting is that Dr. Anderson has gone as far as to set up the chemical formula of this substance that he obtained from the lipoids under the name of "phthioic acid," an exact chemical substance, and this phthioic acid of the tubercle bacillus will cause the changes in the omentum.

A great deal of work is being done now to furnish enough tubercle bacilli—amounting to practically hundreds of pounds of the bovine type—to see whether the phthioic acid of the bovine tubercle bacillus is identical with the phthioic acid of the human tubercle bacillus, and work on the avian type on a large scale will follow, too.

It is still necessary to combine the extract of the hay bacillus with the culture medium used in cultivating the bacillus of Johne's disease, in order to get an abundance of growth, but I would say from these studies that Dr. Hagan reports, that the reacton is, of course, already demonstrated here. Now, whether or not, the actual chemical substance in the fatty acid of the Johne's bacillus, or the avian tubercle bacillus, or the bovine, will check up with the chemical composition of the phthioic acid of the human tubercle bacillus, remains to be seen. Dr. Anderson is working on that phase of it.

DR. E. A. WATSON: This paper is particularly interesting to me, gentlemen, because it seems to have a bearing upon the fate of the B. C. G. vaccine when inoculated into guinea pigs, and I wonder if Dr. Hagan, in his studies, has any data on the tendency to re-absorption and disappearance of these lesions. That is, we know Professor Calmette claims that B. C. G. is harmless, but, when inoculated into guinea pigs, may produce lesions very similar to those Dr. Hagan has described, particularly of the omentum, which have a tendency to disappear. They are most marked about two to three months after inoculation, and then in a great majority of cases tend to disappear, although, contrary to Calmette's claim, some of us have found that in very exceptional cases, after a long period, they do develop into living pathogenic organisms and multiply and produce metastasis, and eventually tuberculosis.

I am also wondering, with Dr. Reichel, in connection with the necessity of growing the bacillus of Johne's disease with the extract of the hay bacillus, whether, if the latter were injected into the guinea pigs at the same time as the culture, it would produce in the peritoneal cavity any more advanced or progressive lesions. I do think that it is an important study and it may throw some light upon the fate of the tubercle bacilli, whether pathogenic, or so-called non-pathogenic, which may become pathogenic if they have some other substance injected with them.

We don't know why it is that in the guinea pig so few cases indicate pathogenicity for B. C. G. Occasionally B. C. G. proves to be virulent, although an experiment repeated by the same research worker in different animals and may be negative, and, when repeated again, a number will show progressive lesions. Just what factor is involved, we don't know yet.

DR. L. W. GOSS: I would like to ask whether you are using killed material as well as the live, and whether it is a multiplication or whether it is just simply the result of organisms placed there.

DR. HAGAN: Answering Dr. Goss first, I would say that we have tried the intraperitoneal inoculation of heat-killed bacilli and the results have been practically the same as when the live bacilli are used. The lesions, therefore, may be produced without multiplication of the bacilli and we feel that this is the case with the Johne bacillus.

Replying to Dr. Watson, we have tried to induce multiplication of the Johne bacillus in the guinea pig's peritoneal cavity by the injection of both living and dead cultures of the phlei organism, and also by the injection of glycerin extracts of this bacillus along with the organism of Johne's disease, without success. We have given multiple injections of the phlei extract and followed it with the Johne organism, and again we have given the Johne organism suspended in a phlei extract, or given the Johne organism first and followed it by the phlei substance. We have not noted any difference in the lesions in any case. It does not appear, therefore, that one can induce the multiplication of the Johne organism in this situation by supplying the "essential substance" of the grass bacillus.

DR. WATSON: The length of time? Did they tend to dissolve after a period of time?

DR. HAGAN: I cannot answer that question directly. I have not examined any of these lesions which were more than about six months old. The largest lesion which you saw on the screen was approximately five months old. The oldest lesions that I have examined have shown bacilli apparently in a perfectly intact condition. We have dead tubercle bacilli lesions several months old exhibiting a similar cellular make-up but in these the bacilli seem to have disappeared. It appears that the organism of Johne's disease is more resistant to the lytic effect of the tissues than is the organism of tuberculosis.

DR. REICHEL: This phthioic acid is obtained from the human tubercle bacillus, and probably it responds faster as a cell-stimulating substance. When injected into a guinea pig, in a few weeks it develops a mass in the omentum the size of a hen's egg, and the Rockefeller Institute has kept animals that have been so injected for many months, and it gradually disappears. If the animal is kept over a year it will completely disappear.

I don't want to comment on that part of it, as much as I want to bring out that while this animal is developing and carrying that mass, it is more susceptible to infection with tubercle bacilli than otherwise. In other words, instead of the possibility that there might be a substance in phthioic acid which would lead to active immunization, it is completely the reverse. The animal becomes more susceptible. There has already been work done, however, which is rather interesting.

DR. B. A. BEACH: There is one factor in our work that may be of interest to this body, and that is that we may find organisms of this group in supposedly normal animals, more especially in the mesenteric glands, but also in the others. We have a few cultures, some of them markedly acid-fast, that we have not classified as yet.

Some time ago, after the inoculation of some experiment animals with some acid-fasts of known origin, these animals were killed and cultured, and we procured acid-fasts of an entirely different nature. Presumably the explanation is that the cultures which were recovered and which were different from those injected, either were present in these animals at the time of injection or developed subsequent to the injection. It is possible that the culture injected underwent a change, but that hardly seems probable, although we do not know. We do know that in culturing the glands of cattle, rabbits and swine, you may pick up acid-fasts almost anywhere, in glands that show no macroscopic evidence of disease whatever, as far as we know or can observe, at least.

DR. WATSON: I would like to ask Dr. Beach if the animals from which he obtained these acid-fast bacilli of various types, were reactors to tuberculin or not.

DR. BEACH: Some of them were, and some of them were not. In some instances, we went to the packing-house and simply took glands from cattle that showed no lesions, regardless of whether they were reactors or not. We had several strains that did come from tuberculin reactors, so-called no-visible lesion cases. We have one culture which was procured from the mesenteric gland of a Guernsey heifer owned by the University. This heifer had never reacted, but had not been tested for some months previous to slaughter. It was simply cultured more for material, and this heifer showed no lesions whatever, and was classed as a non-reactor.

DR. HAGAN: Mr. Chairman, I think I have some information to add to that which Dr. Beach has just given, which may be of interest to some in this

group. I believe that Dr. Beach has gotten most of his-acid-fast cultures from lymph-glands of cattle when he was examining them for the organism of Johne's disease. Dr. Zeissig, Miss Mansfield and I, at one time or another, have picked up a number of these "saprophytic" acid-fast organisms from a variety of sources but principally from cattle lymph-glands in the course of our study of Johne's disease.

These acid-fast bacilli are apparently very widespread in nature. They are certainly present in soils, at least occasionally. Miss Mansfield, this last winter, succeeding in isolating one from a sample of soil which she took from a greenhouse in Ithaca. Possibly the organism came from the fertilizer which was used on this soil but we do not know anything about that. I think that it is only a question of time until someone starts out looking for acid-fasts in soil and he will find them all around us. Some of these organisms I believe will sensitize to tuberculin, at least transitorily, and others apparently will not.

Few Reactors in Indiana

All but two counties in Indiana have made appropriations to carry on tuberculosis-eradication work, and it should be only a short time until all of the Hoosier State is a modified accredited area. Reports indicate that for the month of September, 1929, there were 16,608 cattle tested and only 30 reactors found. When the work was started in Indiana more than this number were frequently found in a single herd. This indicates that but little infection remains to be uncovered. On June 30, 1929, there had been 2,220,744 cattle tested in Indiana, from which 27,781 reactors (1.2 per cent) were removed.

November Set New Testing Record

Steady progress has been made in the tuberculin-testing of cattle in the United States, and in November, 1929, more cattle were given the test than in any month since the beginning of the eradication campaign, according to Dr. A. E. Wight, in charge of tuberculosis eradication for the U. S. Bureau of Animal Industry. The total number of tests made by state and federal veterinarians in November was 1,207,573. Of this number, 17,567 (about 1.4 per cent) indicated the presence of tuberculosis in the animals.

"Previous to last November, there were nine different months in which the number of tests made per month exceeded 1,000,000," reports Doctor Wight, "but in no case did the number reach the 1,200,000 mark. The exceptionally large number of tests in November was due to the fact that eradication work was begun in a large area in Minnesota during that month. The testing work in Minnesota is being done in the extreme northern part of the State, and several of the counties have already been officially designated as modified accredited areas."

THE DOUBLE INTRADERMAL TEST FOR THE DIAGNOSIS OF INFECTIOUS ABORTION IN CATTLE*

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The control of infectious abortion in cattle is at present based principally upon the identification of infected animals by means of serological tests.

The usual criticisms of these tests are: their failure to differentiate between infected and immune animals and the probably less justified criticism of being impracticable on account of the technic necessary for conducting the tests.

Different investigators have attempted to develop methods for identifying Bang-abortion-infected animals by means of thermic and cutaneous reactions.

The successful use of subcutaneous tuberculin and mallein, as diagnostic agents of tuberculosis and glanders, suggests the use of a material similarly prepared from cultures of *B. abortus* as a means for determining this infection in cattle.

M'Fadyean and Stockman,[1] in 1909, reported upon the use of an "abortin" prepared from cultures of B. *abortus*, using methods similar to those employed in the production of tuberculin. This abortin was administered both intravenously and subcutaneously and the results are briefly summarized in the statement of the authors:

> It would appear that a rise of temperature to 104° or more after the injection of "abortin" may possibly be indicative of infection, but it will be necessary to carry out a large number of tests in practice before deciding upon the value of this method of diagnosis.

According to Hutyra and Marek,[2] the attempted confirmatory tests of this method by Brull, Belfanti and Zwick and Wedemann in many cases gave contradictory evidence between the results of the abortin and serodiagnostic methods.

Meyer and Hardenbergh,[3] in 1913, compared the English abortin with their own "purified abortin" that was obtained by a method of alcoholic precipitation of *B. abortus* cultures. They reported to have obtained "encouraging" results by the intra-

*Presented at the sixty-sixth annual meeting of the American Veterinary Medical Association, Detroit, Mich., August 13-16, 1929. Published with the approval of the Director of the Station.

venous injection of the "precipitated abortin," and although the reactions were not absolutely specific, the lack of specificity was greater with the English abortin than the precipitated product.

Reichel and Harkins,[4] in 1917, reported their results, obtained with an "intradermal abortin" that was injected intracutaneously into the caudal fold. The authors stated that this intradermal abortin is "a suspension of washed killed *B. abortus* Bang, freed of all culture media or substances most likely to produce non-specific or pseudo-reactions" and further "that the intradermal abortin should prove more specific for a *B. abortus* (Bang) infection past or present, than abortin as prepared by the English Commission or precipitated purified abortin as prepared by Meyer and Hardenbergh is evident from the very nature of the products."

These writers were of the opinion that the intradermal abortin test found its principal merit in establishing the presence or absence of abortion infection in a herd. In determining the abortion infection status of an individual animal it had less merit. In their experience only a few of the animals claimed to show positive reactions to the agglutination and complement-fixation tests gave positive intradermal reactions. However, no animal showing negative reactions to the serological tests gave positive intradermal reactions.

Stafseth[5] reported, in 1920, upon the use of an intradermal, abortin test, using *B. abortus*-infected guinea pigs as the experiment animals. The abortin that was prepared according to the method of Reichel and Harkins gave the best results. This investigator came to the conclusion that the intradermal abortin test was a reliable and specific test for *B. abortus* infection in the guinea pig and that the detection of infectious abortion in cattle might be possible by such a test.

Holtum,[6] in 1928, published the results of his work with "A Double Intradermal Test for the Diagnosis of Bovine Contagious Abortion." This writer, after reviewing at some length the works of others engaged in somewhat similar efforts, briefly considers the application of the agglutination test as a diagnostic method for determining abortion infection in cattle. Noting the difference of opinion expressed by several authorities as to the titre of non-specific agglutinins in normal bovine blood, Holtum states:

> The lowest titre of serum from an infected animal which will produce a water clear agglutination of *B. abortus*, and can at the same time be

considered as a specific diagnostic reaction, has not as yet been generally agreed upon by laboratory workers.

With this in mind, he concludes "that it is possible to accept as diagnostically positive a titre of 1:25 which is capable of producing complete agglutination of *B. abortus*." His expressed objective, in conducting the experiments upon which he was reporting, was that a test might be devised that would be capable of producing a higher percentage of definite results than the serological reactions, and that would also detect infection in its early stages.

For this purpose he experimented with a double intradermal test, using an antigen that could be prepared without "heroic treatment." The intradermal antigen was prepared from slope-agar cultures of *B. abortus* the growth from which had been suspended in a carbol-saline solution, heated in a water-bath at 65°C. for 30 minutes and standardized to a Gates' measurement of 6 mm. An area of the skin on the side of the neck was prepared for injection by shaving, followed by the application of a disinfectant. Two tenths of a cubic centimeter of the antigen was injected into the dermis. In cases failing to show a definite reaction at the end of 48 hours, a second injection was made at the site of the original inoculation.

Measurements of the thickness of the skin before and after the injections were recorded. Ninety-six hours after the first injection, an increase in thickness double that of the non-injected skin was considered a positive reaction.

Agglutination tests for infectious abortion also were conducted with sera from the animals as checks against the intradermal tests.

Inoculations of guinea-pigs with milk sediment were made in all instances when there was a disagreement between the intradermal and agglutination tests.

Analysis of the results of the tests conducted by Holtum on 87 animals showed 41 as reactors to the intradermal test. The 46 animals giving negative intradermal reactions were also negative to the agglutination test.

Twenty-four of the 41 intradermal reactors were agglutination reactors. Of the 17 intradermal reactors that were negative or indefinite to the agglutination test, 14 showed the presence of *B. abortus* in the milk by means of inoculations of guinea pigs. Of the three remaining animals, two were calves fed infected milk up to three months of age and one was a bull from an infected herd. In other words the infection of *B. abortus* in the 41 intra-

dermal reactors was confirmed in all but three instances, either by positive agglutination reactions or by milk injections of guinea pigs.

These results were of such a character as to interest the present writers in an effort to confirm the work of Holtum.

Technic of Agglutination Test Employed in These Experiments

The agglutination antigen was prepared from six strains of *B. abortus* cultures of bovine origin. These cultures had been subcultured at monthly intervals for several years on nutrient agar having a pH 7.0 — 7.2. The growth of 48-hour cultures was removed with 0.85 per cent saline solution containing 0.5 per cent phenol.

In setting the test 1 cc of antigen and 1 cc of diluted serum were combined. The serum dilutions were a series doubling in each successive tube, ranging from 1:20 to 1:10,240. The final density of the antigen suspension in these tubes was slightly less than tube 1 of a McFarland standard. The tubes were incubated at 37°C. for 48 hours, at which time the reactions were recorded. Blood for these tests was collected prior to the skin injections and the serum titres given in the charts of the different herds represent the highest dilution of the serum in which complete or almost complete agglutination was observed. Each test was controlled by known positive and negative sera.

Agglutination occurring only in the 1:20 dilution was considered to be without significance. Agglutination in the 1:20 and 1:40, but not in the 1:80 dilution, was classed as indefinite or suspicious, while agglutination of the 1:80 and higher dilutions was considered a positive reaction.

Preparation of the Intradermal Antigen

B. abortus strain 10, used for the production of this antigen, was isolated December 19, 1927, from the stomach of an aborted calf. The strain had been carried by monthly subculturing on pork agar (pH 7.0 — 7.2) and grown under slightly reduced atmospheric oxygen. This condition was obtained by blowing air from the mouth into the chamber holding the cultures and then closing its inlet and outlet tubes.

Fresh subcultures were inoculated for 48 hours at 37°C., after which they were held in the dark at room temperature for another 48 hours. They were then put in a refrigerator at 33°-

40°F. After being held under refrigerator conditions for 12 days, the growths were suspended in a phenol-salt (0.5% phenol-0.75% salt) diluent. This suspension was standardized to tube 10 of the McFarland standard, and according to the Gates' method gave a measurement of 5.5 mm. It was then heated at 65°C. for 30 minutes in a water-bath.

Sterility test showed no growth and the antigen was stored in the refrigerator, August 20, 1928, where it was held until used. This one production of antigen was used throughout these experiments.

Technic of Intradermal Injection

The side of the neck was used as the site of injection and was prepared by shaving, followed by liberal swabbing with alcohol. The injections were made superficially into the dermis, using 0.2 cc of the antigen. The injection was made with a 2-cc syringe, fitted with a 26-gauge needle. Animals failing to show definite evidence of reaction, at 48 hours after the initial injection, received a second inoculation. These injections were made at the same point as were the first and a similar amount of antigen was introduced.

Measurements of the Skin

Measurements were taken by applying calipers to a fold of the skin, the span between the calipers point being measured in millimeters. Initial measurements were taken before the injections were made and at 48-hour and 96-hour periods following.

The increase of the dermal thickness resulting immediately after the injection was usually 1 mm., although in some instances and increase of 2 mm. was observed. In considering final measurements no note was taken of this increase, as it was thought that absorptive processes and the range of error in the technic of measurement would offset the thickening induced by the quantity of fluid injected.

The Dermal Response and Its Interpretation

In some animals marked thickening of the skin was noticed at 24 to 48 hours and the peak of the reaction usually appeared at 72 to 96 hours, after the initial injection.

Some animals showed very little swelling or tenderness following the injections, while others would have a dermal thickness 2 to 5 times the normal. Usually in these instances the swellings were warm, somewhat edematous and painful to the animal on

palpation. In most instances the swelling was definitely circumscribed, although occasionally its was diffuse in character.

During the 24 to 48 hours following the height of the reaction, the swelling subsides rather rapidly, after which resolution is more gradual and slight induration may remain for several days or weeks. Occasionally in the more marked swellings a small area of necrosis developed. This was superficial and healed readily.

Following the method of interpretation suggested by Holtum, cases showing an increase of dermal thickness of double or more the original measurements were classed as positive reactions. In some instances a slight deviation from this standard was made, when there was evidence of cutaneous infiltration, heat and pain, even though the measurement failed by 0.5 mm. to reach double that of the normal skin.

Collection of Milk Samples and Guinea Pig Inoculations

Milk samples were collected from the cows after cleaning the udder and milking out a limited amount of milk. Equal amounts of milk were then taken from each quarter. This milk was thoroughly mixed and 15 cc centrifuged for one hour at approximately 2000 r. p. m. The cream and sediment of the centrifuged milk were mixed with 2 cc of saline solution, and 1 cc of this mixture injected intraperitoneally into each of two guinea pigs.

Agglutination tests were run with sera collected before inoculation and at the time of autopsy of each pig. The postmortem examinations were made at approximately 60 days following the inoculations, at which time portions of the spleen were cultured to determine the presence of *B. abortus*.

The methods of procedure that have been outlined were used throughout the following experiments:

Experiment A: Six, 18-month-old Shorthorn heifers and two Shorthorn bulls, one (white) 18 months old and the other (red) 24 months old, were used in this test. The heifers had been raised under range conditions until July 1, 1926, at which time they were about 5 months old. All of the animals gave negative agglutination reactions in December, 1926, and in April and June, 1927.

June 2, 3 and 4, 1927, the heifers were fed living cultures of *B. abortus*. Following this exposure the agglutinin titre of the heifers ran from 1:160 to 1:2560. There was a subsidence in these titres as indicated by tests conducted at 30 to 60-day inter-

vals until in May, 1928, three heifers (2, 4 and 5) had a titre of 1:80, and one (6) of 1:20. Two of the heifers (1 and 3) maintained high titres ranging from 1:640 to 1:2560. The heifers were bred during May and June, 1927, and each gave birth to a living calf after a normal gestation period.

The bulls were purchased from herds with no known history of abortion and were negative to agglutination tests.

These eight animals were given initial injections of intradermal abortion antigen, September 10, 1928. With the exception of heifer 1, second injections were given each animal 48 hours after the first. The reactions following these injections are indicated in table I.

TABLE I—*Reactions in group of six heifers and two bulls (Experiment A)*

No.	Sex	Age (Mos.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum	Classification	
			Normal	After First Injection			Intradermal	Agglutination
				48 Hrs.	96 Hrs.			
1	F.	18	8	22	26	160	R.	R.
2	F.	18	10	11	24	40	R.	?
3	F.	18	9	20	28	320	R.	R.
4	F.	18	9	10	19	40	R.	?
5	F.	18	8	9	11	20	N.	N.
6	F.	18	7	11	21	0	R.	N.
Red	M.	24	11	11	10	0	N.	N.
White	M.	18	13	14	14	0	N.	N.

Discussion of table I: Five of these animals (1, 2, 3, 4 and 6) gave definite skin reactions, the remainder were negative. There was agreement in the skin and agglutination tests in five instances (1, 3, 5, red male and white male). The fact that heifers 2 and 4 had a definite history of exposure to *B. abortus*, and agglutinin titres of 1:40, might be considered as evidence that they were infected. However, their subsequent history of normal calving, the failure to demonstrate the presence of *B. abortus* in vaginal secretions collected shortly after calving, and the negative agglutination reactions of calves from these cows, would seem to justify the agglutination classification as given in the table.

In the case of heifer 6 the results of both the skin and agglutination tests were definite, and no explanation for the disagreement is apparent.

Experiment B: Twelve head of Angus calves, 15 to 16 months old, originating in a herd in which several abortions occurred during the year following their birth, were used for this test.

These calves were weaned when about 8 months of age. Their contact with the remainder of the herd had been rather close until the time of weaning, after which they were retained in an inclosure of the barn in which the remainder of the herd was housed.

The agglutinin titre of the dams of these calves prior to the time the calves were given intradermal injections is unknown. The initial intradermal injection was made October 2, 1928. Each animal received a second injection 48 hours after the first. The results of these injections are indicated in table II.

TABLE II—*Reactions in group of twelve calves (Experiment B)*

No.	Sex	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum	Classification		Agglutinin Titre of Dams at Time of Test
		Normal	After First Injection			Intradermal	Agglutination	
			48 Hrs.	96 Hrs.				
1	F.	9	10	12	0	N.	N.	10,240
2	M.	8	13	24	0	R.	N.	20
3	F.	13	14	17	0	N.	N.	2,560
4	F.	9	19	25	40	R.	?	640
5	F.	10	12	13	0	N.	N.	5,120
6	M.	10	12	15	0	N.	N.	5,120
7	M.	8	24	24	20	R.	N.	320
8	M.	10	26	33	1,280	R.	R.	0
9	M.	10	11	14	0	N.	N.	640
10	M.	9	22	23	0	R.	N.	1,280
11	M.	7	23	24	640	R.	R.	40
12	F.	7	8	13	0	N.	N.	0

M = steer.

Discussion of table II: There is agreement between the skin and agglutination tests in eight of the twelve animals. Heifer 4 gave an indefinite agglutination reaction as compared with a decidedly positive skin reaction. The two tests disagree in three instances. It is of interest to note that of the seven steer calves five gave positive skin reactions while but two gave positive agglutination reactions. The agglutination and skin reactions of these two calves are in agreement.

Experiment C: Twenty-nine head of Angus cows were used in this test. Unfortunately definite history of the animals for more than the past two years could not be obtained owing to a conflagration in which the herd records were destroyed.

However, the older cows of this herd probably had aborted or been exposed to abortion infection, as abortions had occurred in this herd during the past several years. Cows 1 to 12, inclusive, 16, 20, 21, 23, 24, 25 and 29 had normal calving records during the past two years (1927-1928). Cows 13 and 19 aborted

in January, cow 26 in February, cow 27 in March, cows 14, 15 and 28 in June, cows 18 and 22 in August and cow 17 in September, 1928.

The initial intradermal injections were made October 2, 1928. Cows 1, 2, 8, 9, 13, 14, 16, 17 and 22 received second injections 48 hours after the first. Table III indicates the reactions observed in these animals.

TABLE III—*Reactions in herd of 29 cows (Experiment C)*

No.	Age (Yrs.)	Skin Measurements (in mm)			Agglutinin Titre Blood Serum	Classification	
		Normal	After First Injection			Intra-dermal	Agglut-ination
			48 Hrs.	96 Hrs.			
1	16	8	11	19	640	R.	R.
2	14	9	16	26	320	R.	R.
3	14	8	17	22	80	R.	R.
4	13	8	14	20	80	R.	R.
5	12	7	18	32	20	R.	N.
6	10	9	24	33	80	R.	R.
7	10	8	15	36	320	R.	R.
8	8	6	11	16	0	R.	N.
9	8	7	11	18	0	R.	N.
10	7	9	20	27	40	R.	?
11	5	7	10	14	0	R.	N.
12	6	6	12	28	40	R.	?
13	4	9	16	20	2,560	R.	R.
14	4	7	12	15	5,120	R.	R.
15	4	7	16	23	640	R.	R.
16	4	6	8	10	0	N.	N.
17	4	9	15	15	5,120	N.	R.
18	4	8	16	15	10,240	R.	R.
19	3	10	20	21	2,560	R.	R.
20	3	10	18	15	5,120	N.	R.
21	3	9	18	14	5,120	R.	R.
22	3	9	11	12	10,240	N.	R.
23	12	8	16	20	320	R.	R.
24	12	7	15	24	80	R.	R.
25	7	10	18	21	1,280	R.	R.
26	7	7	16	7	2,560	R.	R.
27	5	9	16	23	1,280	R.	R.
28	5	6	12	17	1,280	R.	R.
29	4	9	13	20	640	R.	R.

Discussion of table III: The intradermal and agglutination tests agree in 20 of the 29 animals. Two (10 and 12) are indefinite to the agglutination and react to the intradermal tests. The two tests disagree in seven instances, four of which are intradermal positive and agglutination negative and three the reverse in reactions. Ten animals in this experiment were known to have aborted in 1928, all of which gave positive agglutination tests while but eight are intradermal reactors.

Experiment D: The twenty-six cows used in this test were from a commercial milking herd of Guernsey and Holstein cows and represented animals that had been removed from the main herd on account of their positive reactions to the agglutination test or because of their being prepared for sale.

The breeding history of these animals was too uncertain to be considered seriously and is therefore omitted in dealing with this experiment. The initial intradermal injection was given October 15, 1928.

Cows 2, 5, 14, 15, and 18 to 26, inclusive, received second injections 48 hours after the first. The remainder of the group received only initial inoculations. Results of this experiment are recorded in table IV.

TABLE IV—*Reactions in herd of 26 cows (Experiment D)*

No.	Age (Yrs.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum	Classification	
		Normal	After Intradermal Injections			Intradermal	Agglutination
			48 Hrs.	96 Hrs.			
1	6	6	8	12	10,240	R.	R.
2*	8	5	15	22	320	R.	R.
3*	5	6	8	11	10,240	N.	R.
4*	9	6	9	15	640	R.	R.
5	7	6	17	32	320	R.	R.
6*	5	6	11	22	160	R.	R.
7*	9	8	12	20	1,280	R.	R.
8*	3	8	9	19	0	R.	N.
9*	7	8	9	16	0	R.	N.
10*	6	7	9	13	1,280	N.	R.
11*	9	9	11	13	10,240	N.	R.
12*	6	8	11	18	160	R.	R.
13	3	5	8	11	0	R.	N.
14	7	5	11	19	0	R.	N.
15*	8	7	14	24	10,240	R.	R.
16*	6	6	7	13	80	R.	R.
17*	10	6	11	14	10,240	R.	R.
18*	6	9	10	12	0	N.	N.
19*	8	5	8	24	160	R.	R.
20*	6	5	22	46	0	R.	N.
21*	9	6	11	15	160	R.	R.
22	9	8	13	22	640	R.	R.
23*	7	5	9	10	10,240	R.	R.
24	6	6	16	22	40	R.	?
25*	6	5	12	22	40	R.	?
26	8	7	18	25	320	R.	R.

*Milk samples were collected for guinea-pig inoculation.

Discussion of table IV: In sixteen of the twenty-six cows there is complete agreement of the intradermal and agglutination tests. Cows 24 and 25 gave indefinite agglutination reactions and positive intradermal reactions.

The two tests disagree in eight instances, five of which (8, 9, 13, 14 and 20) were intradermal positive and agglutination negative and three (3, 10 and 11) had reactions of reverse order.

Milk samples were collected from nineteen of the cows (2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 23 and 25) for guinea pig inoculations. Two guinea pigs were inoculated from each sample. Two months after their inoculation, the pigs were killed and spleen cultures made to determine the presence of *B. abortus*. Five of the inoculated guinea pigs died prior to the end of their test, but in no instance did death occur in both of the pigs inoculated with the same milk sample.

Agglutination tests for *B. abortus* infection were conducted with blood serum obtained from the guinea pigs, both before the milk injections and at the time they were killed. All gave negative agglutinin titres before injection, while at the termination of their test period those receiving injections of milk from cows 3, 11, 12, 15, 17 and 23 gave titres of at least 1:160. Cultures of *B. abortus* were obtained from the spleens of pigs receiving milk from cows 11, 12 and 23.

These results indicate the presence of *B. abortus* organisms in the milk of cows 11, 12 and 23, while it is probable that the organisms may have been present in the milk of cows 3, 15 and 17.

Comparing the results of the guinea pig inoculations with the intradermal and agglutination reactions of the eight cows in which these two tests disagree, it is seen that milk samples had been taken from three of the five cows that gave positive skin but negative agglutination reactions, all of which proved negative to guinea pig inoculation.

Milk samples had been obtained from each of the three cows that were positive agglutination but negative intradermal reactors. The milk from two of these cows gave evidence of the presence of *B. abortus*.

Experiment E: This group of animals, composed of seven Holstein and three Jersey cows, was from a herd in which no case of abortion was known to have occurred during the past four or five years. However, prior to this time, numerous abortions had occurred in the herd from which the younger cows in this test originated.

Cows 1 and 2 (table V) were from the original herd and had given positive agglutination reactions in tests conducted at different intervals during the past four years.

The cows were all with calf at the time of this investigation. Other than some difficulty with sterility, thought to be due to impotency of the herd bull, the mature cows had a history indicating an absence of abortion infection. The other cows (40 head) of the main herd, from which this group of animals was selected, gave negative agglutination reactions when tested at the time of beginning this experiment.

Intradermal injections of this group of cows were made April 14, 1929, each animal receiving a second inoculation 48 hours following the initial injection.

The results of the test are indicated in table V.

TABLE V—*Reactions in group of ten cows (Experiment E)*

No.	Age (Yrs.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum	Classification	
		Normal	After First Injection			Intra-dermal	Agglut-ination
			48 Hrs.	72 Hrs.			
1*	15	6	16	31	160	R.	R.
2*	13	6	22	31	160	R.	R.
3*	8	7	10	13	40	N.	?
4*	7	7	8	11	0	N.	N.
5*	6	7	9	9	0	N.	N.
6*	6	5	8	9	0	N.	N.
7	2	7	11	12	40	N.	?
8	2	7	9	10	0	N.	N.
9	2	7	9	11	0	N.	N.
10	2	10	10	12	40	N.	?

*Milk samples obtained for guinea pig inoculation.

Discussion of table V: The two tests agree in seven of the ten cows. The three others show indefinite agglutination and positive intradermal reactions. The dermal thickening in two of these three cows closely approached that taken as indicating infection. However, the site of injection showed little evidence of increased warmth or tenderness.

Milk samples were collected from cows 1 to 6, inclusive, for guinea pig inoculation. In no case did the results of these inoculations show evidence suggesting the presence of *B. abortus*.

Analysis of Experimental Data

In considering these data, it is assumed that animals having agglutination and intradermal tests in agreement are of the status indicated by the tests.

A total of 85 cattle were tested, 60 (70.5 per cent) gave positive and 25 (29.4 per cent) gave negative intradermal reactions.

Of the 60 intradermal reactors, 40 were positive, 7 questionable and 13 negative to the agglutination test. None of the questionable or negative agglutinating animals had an abortion history.

Of the 25 intradermal negative cattle, 16 were negative, 3 questionable and 6 positive to the agglutination test.

In the group of 6 that were negative to the intradermal but positive to the agglutination tests, 2 had histories of abortion, 2 gave abortion organisms in the milk, and 2 had no history of abortion and their milk samples were negative.

Of the 3 that were negative to the intradermal but questionable to the agglutination tests, 2 were pregnant heifers, and one a cow that had no history of abortion.

Forty-six (54.1 per cent) of the 85 cattle tested were positive, 10 (11.7 per cent) questionable, and 29 (34.1 per cent) negative to the agglutination test.

Of the 46 agglutination positive cattle, 40 were positive and 6 negative to the intradermal test. Of the latter, 2 had abortion histories, one gave a positive milk sample and 3 had no abortion histories and their milk samples were negative.

In the group of 10 that were questionable to the agglutination test, 7 were positive and 3 negative to the intradermal test. In none of these was there a history of abortion.

Of the 29 that were negative to the agglutination test, 16 were negative and 13 positive to the intradermal test. None of the 13 had histories of abortion.

Summary

It is evident that under the conditions of these experiments more animals give positive intradermal than agglutination reactions.

In these experiments no animal that was positive to the intradermal and negative to the agglutination test had a history of abortion infection; while of six animals that were positive to the agglutination and negative to the intradermal test, four had definite histories of abortion infection.

From these data it would appear that the intradermal test would incriminate a rather large percentage of non-infected animals, whereas it would fail to detect some animals that were infected.

Comparison of Reactions from Single and Double Intradermal Injections

In preliminary work with the double intradermal test, the writers were impressed with the possible futility of the second injection. To secure some data upon this point, at the time of conducting the regular intradermal tests, a group of animals was selected at random from each of three herds and given single intradermal injections only.

Tables VI, VII and VIII show the reactions following single intradermal injections of groups of animals the origin of which is comparable to those of tables II, III and IV, respectively.

Similar methods and intradermal antigen were used in these tests.

Experiment F: Eleven Angus calves from the same source as those of experiment B were given single injections of intradermal antigen. The skin reactions resulting from these injections are shown in table VI.

Table VI—*Reactions in eleven calves. Single intradermal injection only (Experiment F)*

No.	Age (Mos.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum	Agglutinin Titre of Dam at Time of Test
			After First Injection			
		Normal	48 Hrs.	96 Hrs.		
1	15	10	13	16	40	5,120
2*	15	9	18 R.	15 R.	40	80
3*	15	8	19 R.	25 R.	0	5,120
4*	15	9	11	12	0	0
5*	15	8	10	10	0	40
6	15	8	18 R.	17 R.	80	5,120
7	15	9	13	15	0	1,280
8*	15	8	9	10	0	0
9	15	8	11	12	20	10,240
10	15	8	9	10	0	320
11*	15	7	10	13	0	80

*Steers.

Three animals were intradermal reactors at the 48th hour following their injection. The number of reactors remained the same at the 96-hour observation.

Experiment G: The ten Angus cows used for this test were from the same herd as those used in experiment C.

Definite histories of cows 1, 2 and 3 could not be obtained but all had calved normally during the past three years. The remaining seven cows produced normal calves during 1927.

Cow 5 had calved in January and again in November, 1927, and Cow 8 was with calf at the time of the test.

Cows 4, 6, 7, 9 and 10 had aborted in February, March, June, May and May, 1928, respectively.

Table VII gives results of the single intradermal injections of these animals.

TABLE VII—*Reactions in ten cows. Single intradermal injection only (Experiment G)*

No.	Age (Yrs.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum
		Normal	After First Injection		
			48 Hrs.	96 Hrs.	
1	12	8	16-R.	20-R.	320
2	12	7	15-R.	24-R.	80
3	7	10	18	21-R.	1,280
4	7	7	16-R.	17-R.	2,560
5	6	8	12	16-R.	320
6	5	9	16	23-R.	1,280
7	5	6	12-R.	17-R.	1,280
8	4	9	13	20-R.	640
9	4	9	13	13	5,120
10	3	10	15	17	2,560

At the 48-hour observation there were four, and at the 96th hour there were eight intradermal reactors.

Experiment H: The eighteen cows in this test were from the same herd as those in experiment D and a definite history of the individuals was not available.

TABLE VIII—*Reactions in eighteen cows. Single intradermal injection only (Experiment H)*

No.	Age (Yrs.)	Skin Measurements (in mm.)			Agglutinin Titre Blood Serum
		Normal	After First Injection		
			48 Hrs.	96 Hrs.	
1	6	9	10	12	0
2	8	5	8	24-R.	160
3	4	6	8	10	2,560
4	7	7	9	16-R.	0
5	3	7	10	15-R.	40
6	3	8	11	13	20
7	6	5	22-R.	46-R.	0
8	7	6	9	13-R.	160
9	9	6	11	15-R.	160
10	9	8	13	22-R.	640
11	10	9	14	29-R.	320
12	6	8	9	12	40
13	2	7	10	9	0
14	7	5	9	10-R.	10,240
15	6	6	16-R.	22-R.	40
16	6	5	12-R.	22-R.	40
17	8	7	18-R.	25-R.	320
18	8	7	10	11	0

The results of the single intradermal injection are given in table VIII.

In this test four animals gave intradermal reactions at the 48th hour and twelve at the 96-hour heading.

Discussion

Combining the results of the reactions following the regular double intradermal injections, as shown in tables II, III and IV, it is seen that, of a total of 77 animals tested, 28 gave intradermal reactions at the 48th hour and 55 at the 96-hour reading. Whereas, a similar consideration of tables VI, VII and VIII, representing the single intradermal injected animals, shows that 11 of 39 animals were reactors at the 48th hour and 23 at the 96-hour observation.

Considered on a percentage basis, the increase in the number of reactors observed at 96 hours following injection, over that at the 48-hour reading, was 50.9 per cent in the case of the double injected animals, as compared with 47.8 per cent in those receiving but a single intradermal injection.

In making these comparisons the obvious impossibility of having groups of animals of identically the same character was fully recognized. To overcome this inequality it was decided to attempt both the single and double injection methods simultaneously, using opposite sides of the neck for each test.

Holtum,[6] in his first experiment, draws attention to the observation "that the first (sensitizing) injection does not produce any systemic reaction, as tested by an injection of 0.2 cc antigen 48 hours later on the opposite side of the neck."

Taking this as evidence of the lack of interference of the intradermal injection made on one side of the neck with a similar injection on the opposite side, the following experiment was undertaken:

Experiment I: Ten cows, representing positive, indefinite and negative agglutination reactors, were selected for the test. Each side of the neck at approximately the same height was prepared and single intradermal injections made at these sites. Forty-eight hours following the initial injections, a second inoculation was given each animal on the left side only. The usual measurements were made on each side. Table IX shows the extent of reactions produced.

Discussion of table IX: With the exception of one animal (cow 3) the maximum difference in the increased thickness of skin on

TABLE IX—*Reactions in ten cows injected on both sides of neck (Experiment I)*

Cow	Skin Measurements (mm.)						Increased Thickness of Skin over Normal (mm.)		Agglutinin Titre
	Normal		48 Hours		72 Hours				
	R*	L	R	L	R	L	R	L	
1	7	6	18	16	32	31	25	25	1:160
2	6	6	22	22	29	31	23	25	1:160
3	7	7	9	10	9	13	2	6	1:40
4	7	7	8	8	8	10	1	3	0
5	6	7	11	9	10	9	4	2	0
6	5	5	7	8	7	9	2	4	0
7	7	7	10	11	10	12	3	5	1:40
8	6	7	9	9	10	10	4	3	0
9	6	7	7	9	9	11	3	4	0
10	10	10	10	10	10	12	0	2	1:40

*R = right, L = left. Only the left side received second injections.

the double injected side, over that of the single injected side, was but 2 mm. In the case of cow 3 there was a difference of 4 mm.

Since these results did not change the classification of any of these cows when judged by the standard taken for this purpose, the slight increase of the double injected side over that of the single is considered to have little or no significance.

The influence of slight leakage of antigen from the needle opening in the skin, that might vary with different animals, as well as the possible effect of injections made at different depths of the skin, are points that might have a bearing upon these results but concerning which no information was obtained.

From these tests it appears that a single intradermal injection of antigen would produce results closely comparable to those of the double injection.

Effect of Intradermal Injection of Abortin on the Agglutinin Titre

The possible influence of the intradermal injection of abortin upon the agglutinin titre of the injected animal would become a question of considerable importance if the intradermal test were to be used extensively.

The present extensive use of the agglutination test in the diagnosis of infectious abortion in herds where measures of eradication are being practiced, its requirement by some states for interstate shipment of breeding cattle, as well as its possible use in public health work for the establishment of herds from which *B. abortus*-free milk can be obtained, make the use of any biologic

capable of materially affecting the agglutinin titre a factor worthy of careful consideration.

Holtum, considering two animals, noted an increase in agglutinin titre, seven days after the intradermal injection of abortin, from 1:50 to 1:100 in the infected heifer and no increase in the control animal. Concerning this he states:

> The titre had increased in the test animal, but the increase recorded does not justify the assumption that it was due to the injections, as fluctuations of this nature are a common occurrence in reactors which have not been subjected to any form of interference beyond the actual withdrawal of blood samples.

Studying his work further it is noted that in one experiment (IX) the animals were reinjected three months after the first test. Comparison of the agglutinin titres of these animals, obtained at the time of the two tests, shows a definite decrease in the height of the titres at the later test.

An opportunity was afforded the writers for retesting the animals in two (A and E) of the foregoing experiments, the results of which are shown in tables X and XI.

TABLE X—*Agglutinin titres of animals in experiment A*

	Before Injection			Intradermal injection of 0.2 cc abortin, Sept. 10 and 12, 1929	After Injection					
No.	7-14-28	8-14-28	9-10-28		2 Wks.	4 Wks.	6 Wks.	8 Wks.	10 Wks.	12 Wks.
1	320	320	160		640	1,280	640	320	640	640
2	20	40	40		1,280	1,280	640	160	160	20
3	1,280	640	320		640	2,560	5,120	2,560	640	5,120
4	20	20	40		640	640	160	80	80	20
5	20	20	20		1,280	1,280	160	160	160	40
6	0	0	0		640	640	80	40	40	20
R. M.	0	0	0		160	320	80	40	80	0
W. M.	0	40	0		160	160	20	20		

TABLE XI—*Agglutinin titres of animals in experiment E*

No.	6-2-28	4-12-29	Intradermal injections of abortin: 0.2 cc, Apr. 14; 0.2 cc, Apr. 16	70 Days After Injections
1	200	160		640
2	200	160		160
3	25	40		160
4	0	0		80
5	25	0		160
6		0		80
7		40		80
8		0		80
9		0		80

Discussion of tables X and XI: The animals in table X show a decided increase of agglutinin titre following the intradermal

injections. In general the peak of this increase is reached at the fourth week and then gradually subsides.

In table XI, where the retest was obtained 70 days after the intradermal injections, each animal shows a definite increase in agglutinin titre.

The criticism might be offered that two animals in each of these groups had been definite reactors to the agglutination test and a spread of infection from them might have caused the rise in agglutinin titre. Unfortunately this phase of the work was not protected by suitable controls. However, transmission of infection is not probable, as the animals of each group had been associated for a considerable period of time prior to the intradermal injections without affecting their agglutinin titres. Also, the reacting cows had not aborted or calved during this period, and *B. abortus* infection was not demonstrated in milk samples collected from these cows.

Conclusions

Considering the limited number of animals used in these different tests, definite conclusions are not warranted. However, the following tentative deductions are made:

The intradermal test gives a larger percentage of positive reactions than the agglutination test.

Some animals, giving negative intradermal reactions, harbor *B. abortus*.

A single intradermal injection gives as satisfactory results as a double injection.

The agglutinin titre of animals injected with intradermal abortin may be materially increased temporarily following the injections.

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[3]Meyer, K. F., and Hardenbergh, J. B.: On the value of the "abortin" as a diagnostic agent for infectious abortion in cattle. Jour. Inf. Dis., xiii (1913), 3, pp. 351-374.

[4]Reichel, John, and Harkins, Malcolm J.: The diagnosis of infectious abortion of cattle (Bang's disease) with special reference to the intradermal abortin test. Jour. A. V. M. A. 1 (1917), n. s. 3 (7), pp. 847-862.

[5]Stafseth, H. J.: Studies in infectious abortion. Part III, on the possibility of differentiating between infected and immune animals in infectious abortion. Mich. Agr. Col. Exp. Sta. Tech. Bul. 49 (1920).

[6]Holtum, A. W.: A double intradermal test for the diagnosis of bovine contagious abortion. Jour. Comp. Path. & Therap., xl (1928), 1, p. 25; 2, p. 79.

Discussion

Dr. Alex. Zeissig: This paper interests me because it seems to be about the same situation we have encountered in comparing allergic and serologic tests in the acid-fast infections. In the early stages of disease there seem to be no demonstrable serum antibodies, but the animal will react to allergic products such as tuberculin or abortion. There then follows a period during the course

of the infection when reactions are obtained both to allergic products and serologic tests. As the disease progresses further, the response to the injection of allergic products becomes weaker and weaker, so that an animal in the last stages of Johne's disease, for instance, will not react even to large doses of avian tuberculin but will give a strong serological reaction. This same fact is illustrated in the first chart exhibited, in which a group of eight animals having the highest serum titres were negative to the abortion test. Apparently the allergic test is more marked in infected animals where there are no serum antibodies. Where serum antibodies are present, they tend to neutralize the allergic products when they are injected and tend to diminish the reaction of the animal to them, if they do not prevent the reaction entirely. This is in entire accord with the facts known to influence reactions due to altered susceptibility.

DR. C. P. FITCH: We have used the intradermal test very little, using the fold of the tail as the site of the injection. Our results have been very unsatisfactory, both in known infected animals—when I say "known infected animals" I mean animals from which we have isolated the abortion organism—and also in known uninfected animals, animals from which we have failed, after periods of years, to isolate the abortion organism.

DR. WARD GILTNER: It will perhaps interest the gentlemen to know that a few years ago Dr. Huddleson developed a vaccine which, when introduced into an animal, will not stimulate the production of agglutinins. It is being experimented with now, on an extensive scale, and I am quite sure that if we can develop a vaccine which is safe and effective, and which will also not stimulate the production of agglutinins, it will meet most of the objections that we have heard against vaccine.

Visitors at the Journal Office

The following veterinarians have visited the JOURNAL office during the past few months on various missions of one kind or another: Dr. W. N. Armstrong, Concord, Mich.; Dr. B. J, Killham, Lansing, Mich.; Dr. S. A. Wells, Eagle, Mich.; Dr. E. T, Hallman, East Lansing, Mich.; Dr. L. H. Briggs, Dr. Harry L. Cotton, Dr. C. W. Eddy, Dr. Joseph Hawkins, Dr. John Hoberg, Dr. Donald T. Kemp, Dr. E. E. Patterson, Dr. J. E. Patterson, Dr. L. H. Pless, Dr. G. W. Rawson and Dr. A. S. Schlingman, of Detroit.

PERSONALS

Dr. I. B. Irwin (Ont. '11), formerly of McCreary, Man., has accepted a position with the Meat Inspection Division, Health of Animals Branch, Canada Department of Agriculture, and is now stationed at Montreal, Que.

Dr. O. H. Ruddle (Ind. '18), who has been employed by the State of Virginia as veterinary inspector since 1926 and stationed at Salem, has accepted a position as veterinarian to the Hot Springs Company, effective January 1, 1930. Dr. Ruddle is now located at Warm Springs, Va.

Dr. Benjamin McInnes (R. C. V. S. '74), of Charleston, S. C., visited his son-in-law and daughter, Dr. and Mrs. Emlen Wood, of Greenwich, N. J., during the Christmas holiday season. Dr. McInnes remained over for the Veterinary Conference at the University of Pennsylvania, January 8 and 9.

Dr. W. F. Fisher (Colo. '23), of Yerington, Nevada, spent most of the month of December in Mount Zion Hospital, San Francisco, where he had a dropped colon replaced, his appendix removed and several adhesions in the peritoneal cavity taken care of. A report received early in January indicated that he was making slow but satisfactory progress toward recovery.

A COMPARISON OF THE AGGLUTINATION AND COMPLEMENT-FIXATION TESTS FOR THE DETECTION OF BRUCELLA ABORTUS INFECTION*

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The first investigators to apply serologic methods for the diagnosis of infectious abortion caused by *Brucella abortus* Bang were Grinsted[1] and Holth,[2] in 1909. These investigators found the agglutination and complement-fixation tests to be reliable means for detecting infected animals. They apparently found close agreement in the results obtained by both methods. It must be remembered in this connection, however, that these earlier experiments were conducted in some cases with what might be considered hyperimmune sera, since they were produced by injecting animals experimentally with multiple doses of *Brucella abortus*. Since this time these diagnostic methods have been applied on a large scale to sera from animals naturally infected and from normal animals associated with them. The literature containing reports on the field application of the tests is voluminous and need not be reviewed in detail here.

Opinions regarding the reliability of the tests vary. Some investigators believe them to be a very reliable means of diagnosis, whereas others doubt this. Apparently there has been considerable lack of agreement between the two tests, so that it is believed that the mechanism in the serum of an infected animal which causes agglutination is quite distinct from that which brings about complement fixation. This is evidenced by the fact that "agglutinating bodies" and "complement-fixing bodies" are spoken of, and that it is believed that the serum of an animal may contain the one and not the other. It does not seem reasonable to assume that as a result of infection there are produced only certain types of antibodies. Some immunologists are of the opinion that there is brought about, in the serum of an animal as a result of infection, a particular change which may be manifested in several ways. In accordance with this view, the various

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serologic tests are the means of detecting this particular change much as are the various tests for protein means of detecting the presence of that substance. It is difficult to understand why, in certain instances, a particular technic should not be effective in detecting this change. It might be explained on the basis of failure, on the part of the animal, to produce a particular type of antibody, but the explanation is more apt to be found within the technic itself.

In the course of some complement-fixation work with acid-fast infections, we were using an abortus antigen which consisted of a suspension of *Brucella abortus* in physiological salt solution. On several occasions agglutination tests with *Brucella abortus* antigen were conducted on the same serum samples, and lack of agreement between the agglutination and complement-fixation tests was noted. This finding prompted the present inquiry, since we were anxious to have our results as reliable as possible. We accordingly enlisted the cooperation of Dr. R. R. Birch, and with his assistance the following plan was devised:

Herd Tested Monthly

The agglutination test for contagious abortion is conducted at regular monthly intervals on the Experiment Station herd of the college. This herd consists of about sixty animals. During the past year duplicate serum samples have been taken from the animals of this herd and examined also by the complement-fixation test. The agglutination tests have been conducted according to the technic of Birch and Gilman[3] by the Experiment Station staff, and their results have been made available to us for comparison. The technic of the complement-fixation test has not been exactly the same throughout the course of the investigation, for as soon as possible improvements were observed, the procedure was modified to include them.

Briefly, the procedures we have followed are these: Goat blood was used as a source of erythrocytes and was employed preferably freshly drawn. The volume of erythrocyte suspension necessary to conduct the tests at hand was calculated and sufficient blood was taken to insure an adequate quantity of washed cells. This having been determined, the blood was accurately measured and the cells washed three times with physiological salt solution. After being washed they were resuspended in a volume of physiological salt solution forty times as great as the volume of blood used at the outset. In other words, the suspension of cells re-

presented a 2.5 per cent suspension on the basis of whole blood. This is less dense than is ordinarily employed, but readings are easily made and, we believe, are sharper than more dense suspensions permit. These cells were sensitized with an equal volume of anti-goat hemolytic amboceptor containing approximately 4 units. The antigen was employed in 0.5-cc amounts after having been first titrated for its anticomplementary and antigenic properties with a negative and a positive serum, respectively. The unit selected was one which allowed an adequate margin of safety from both standpoints.

Titrating the Complement

In titrating the complement a basic dilution of one to ten was employed and distributed in a series of six tubes beginning with 0.2 cc and decreasing the dose by 0.025 cc from tube to tube. The volume was made up to 0.5 cc in each case with physiological salt solution and 1 cc of the sensitized red cell suspension was added. The tubes were then placed in a water bath at 37°C. for 15 minutes, when they were removed and examined. The smallest amount of complement causing complete hemolysis was designated the unit. For rapid fixation (one and one-half to two hours at 37°C.), one unit of complement was used. For cold fixation (twelve to eighteen hours in the refrigerator), the next highest amount above the unit was employed.

The Test Proper

In the test itself the antigen (0.5 cc) was placed in the tubes. A drop of the serum under examination, previously inactivated at 60°C. for one-half hour, was then allowed to fall directly into the antigen from the tip of a 1-cc pipette held in a vertical position above the tube. This is equivalent, on the average, to 0.05 cc of serum. The complement was then added and, after thorough shaking, the tubes were incubated either by the rapid or cold fixation method mentioned above. To detect the presence or absence of fixation of the complement, 1.0 cc of the sensitized cell suspension was added to each tube and, after thorough shaking, the tubes were again placed in the water-bath at 37°C. The process of hemolysis was followed by examining the tubes at intervals. As soon as a few of the negative sera, of which there were several in each group, were completely hemolyzed, the tests were removed and read. After the first reading the tests were placed in the ice-box to allow the cells to settle. Later they were

read a second time to determine whether further hemolysis had taken place.

In addition to this single-tube test, a series of tubes containing multiple dilutions of the serum under examination was set up. These tubes contained the same actual amount of serum as the tubes in the agglutination test with which they were to be compared, rather than the same dilution, since the total volume was not the same in both cases. By this means results were made comparable, for it is recognized that the dilution of a particular reagent, within reasonable limits, has no marked influence on its effectiveness in serological reactions.

During the course of this investigation we have observed certain points of technic in the complement-fixation test which have a considerable bearing on the results obtained both as to their consistency and their agreement with the agglutination test. At the outset we were employing as an antigen a simple saline suspension of *Brucella abortus* grown 24 to 48 hours on infusion agar. With this antigen our results were not very consistent, nor did they agree closely with the agglutination test. Sometimes only a few animals would react; at others, every sample of serum under examination was positive.

Lipoids Play Important Role

There has been considerable work done by Torikata and his coworkers which throws light on the mechanism of the complement-fixation test. Torikata[4] has shown that lipoid substances are essential for complement fixation, in fact that they are the substances which actually fix or bind complement. On this basis we reasoned that the erratic results obtained with *Brucella abortus* and perhaps with other organisms of a similar nature might be due to the fact that they did not contain sufficient lipoid. We therefore set about to determine whether it would be possible, by increasing the lipoid content of our antigen by means of the addition of cholesterol, to obtain more satisfactory results.

A large quantity of *Brucella abortus* was grown on infusion agar in Blake bottles 24 to 48 hours and washed off in a minimum of physiological salt solution. To this very turbid suspension sufficient 95 per cent alcohol was added to cause the organisms to agglutinate. They were then centrifuged out of suspension and washed several times in 95 per cent alcohol, followed by absolute alcohol and ether, after which they were washed out of the centrifuge-tube into a mortar with a minimum of ether. Follow-

ing the evaporation of the latter they were ground into a smooth powder with a pestle. A weighed amount of this dried, powdered *Brucella abortus* was then placed in a mortar, 10 per cent cholesterol by weight was added, and the mass covered with ether. The cholesterol dissolved, and the pasty mass was triturated to insure uniformity of distribution during the evaporation of the solvent.

The resulting powder was suspended in physiological salt solution for use as an antigen. This antigen was found in a number of trials to give very clean cut and consistent results. The bacterial residue alone, without the addition of cholesterol, gave equally good results. The cholesterol, therefore, had no appreciable influence in improving the quality of the antigen, there being apparently sufficient native lipoid already present. The improvement was due rather to the removal of substances in solution in the saline-alcohol mixture. This supernatant fluid, after the organisms had been centrifuged out, had a pale yellow tinge, and presumably contained soluble constituents of the medium on which the organisms had been grown.

Non-specific Fixation of Complement

No doubt among these were substances which interfered with the complement-fixation test by fixing complement non-specifically. It seems desirable, therefore, to get rid of the constituents of the medium on which the antigen has been grown. This was also observed by Holth who remarked that better results were obtained when the organisms were centrifuged out of the broth on which they had been grown than when the entire culture was used as an antigen. In view of the fact that better yields of growth are obtained in a much shorter time when a solid medium is used, the method outlined above would seem to be much superior to the older method of preparing antigen which is still in use in some laboratories in this country. The dry powder obtained can be stored in vials protected from the air, and as far as we know will maintain its usefulness for a period of at least a year. It can be suspended in physiological salt solution at an arbitrary rate—we have chosen 2 per cent—when a fresh supply is needed for conducting tests.

This change in antigen did not remove all of the difficulties. There were still certain animals which in the single-tube tests were negative and in the agglutination tests were strongly positive. The record of such an animal is appended (table I). These same animals, when serum dilutions were employed, were negative in

the tubes containing the largest amounts of serum and positive in those containing the smallest amounts. If one watches the process of hemolysis as it goes on in the control tubes, he will observe that the serum control tubes containing a quantity of inactivated serum in addition to the hemolytic system hemolyze much more rapidly than does the control tube containing the hemolytic system alone and also much more rapidly than do the antigen control tubes. The addition of bovine serum, then, increases the hemolytic activity of the system. We have made some quantitative studies of the influence of a drop (0.05 cc) of inactivated bovine serum on the complement unit and have found

TABLE I—*Individual record of animal 275*

	Agglutination Test						Complement-Fixation Test*									
	Serum (cc)						Serum (cc)					Single Tubes (0.05 cc)				
												Old Antigen		New Antigen		
Date of Test	0.1	0.05	0.025	0.0125	0.00625	0.003125	0.05	0.025	0.0125	0.00625	0.003125	Rapid	Cold	Rapid	Cold
7-17-28	+	+	+	+	+	+						3	1		
8-16-28	+	+	+	+	+	+						½	½		
9-14-28	+	+	+	+	+	+						1	3		
10-16-28	+	+	+	+	+	+	3	3	3	4	4	C	4	C	3
11-15-28	+	+	+	+	+	+	C	C	3	4	4	C	C	C	4
12-17-28	+	+	+	+	+	+	½	½	2	3	3		C	C	2
1-21 29	+	+	+	+	+	+	2	2	2	2	2		C		½
2-19-29	+	+	+	+	+	+	3	4	4	4	4		3		3
3-14-29	+	+	+	+	+	+	C	4	4	4	4		C		C
4-16-29	+	+	+	+	+	+	2	4	4	4	4		4		4
5-15-29	+	+	+	+	+	+	2	4	4	4	4				2
6-17-29	+	+	+	+	+	+	2	4	4	4	4				3
7-15-29	+	+	+	+	+	+	C	3	3	3	3				C

*The symbols used in the complement-fixation test are to be interpreted as follows: 4 = complete fixation; 3 = three-quarters fixation; 2 = one-half fixation; 1 = one-quarter fixation; ½ = trace; C = no fixation.

that such an amount of serum decreases the complement unit approximately 0.05 cc, even though the serum had previously been inactivated by heat. The serum, in addition to actually increasing the hemolytic activity of the complement, by virtue of certain of its protein constituents also conserves the complement during the primary incubation period. This was found to be an attribute of negative as well as positive sera. The addition of serum in the complement-fixation test may have, then, two diametrically opposed actions. If it contain antibody there will be one force tending to fix complement in the presence of the specific antigen. Whether it contain antibody or not it will, being

serum, tend to increase the activity of complement in producing hemolysis. When larger amounts of serum are used (0.05 cc or more), the last mentioned activity is greater than with smaller amounts and may overpower the complement-fixing activity of the serum. Since the serum cannot be altered in any known way to overcome this activity, it seems essential that where single tubes are employed for diagnostic purposes the amount of serum be used in amounts less than 0.05 cc. It has been observed by Boerner and Stubbs[5] and others that the results obtained wiht

TABLE II—*Herd test of October 16, 1928*

Serial Number	Animal Number	Agglutination Test						Complement-Fixation Test							
								New Antigen					Single Tubes		
		Amount of Serum (cc)						Amount of Serum (cc)					Old		New
		0.1	0.05	0.025	0.0125	0.00625	0.003125	0.05	0.025	0.0125	0.00625	0.003125	Rapid	Cold	Rapid	Cold
1	297	+	p	—	—	—	–	C	C	C	C	C	3	4	C	3
2	215	+	+	+	+	+	+	4	4	4	4	4	2	4	4	4
3	281	+	+	+	—	–	—	½	C	C	½	½	4	4	C	2
4	197	+	+	—	—	—	—	C	C	C	½	½	1	4	C	C
5	257	+	+	–	—	-	–	C	C	C	½	½	2	3	C	4
6	241	+	+	+	p	—	–	4	4	4	3	1	C	4	4	4
7	247	+	+	+	+	—	—	½	½	½	½	½	½	4	½	½
8	234	+	+	+	+	+	—	3	3	2	1	1	C	3	3	3
9	290	+	+	—	—	—	—	C	C	C	C	C	C	1	C	C
10	235	+	+	+	+	+	+	2	3	3	3	1	2	4	4	4
11	229	+	+	—	—	—	—									
12	349	+	+	—	—	—	—	C	C	C	C	C	C	2	C	C
13	312	+	p	—	—	—	—	C	C	C	C	½	C	2	C	C
14	293	+	+	+	+	+	+	2	2	3	3	1	4	4	4	3
15	272	+	+	+	+	p	—	3	4	4	3	2	2	4	4	4
16	270	+	+	+	+	+	+	C	4	4	4	4	2	2	2	4
17	269	+	+	—	—	—	—	C	C	C	C	½	C	C	C	1
18	292	+	—	—	—	—	—	C	C	C	C	C	C	2	C	C
19	218	+	—	—	—	—	—	C	C	C	C	C	C	2	C	C
20	346	+	+	—	—	—	—	C	C	C	C	C	C	4	C	C

the complement-fixation test were usually either clear-cut positive or negative. The increased hemolytic activity of the complement noted above probably accounts for this, since in their tests these investigators employed 0.1 and 0.2 cc of serum.

We noted during the course of the investigation that the results obtained by the complement-fixation test, when the primary incubation was carried out for from 12 hours to 18 hours in the refrigerator instead of for an hour or two at 37°C., agreed more closely with the agglutination tests. The fixations also seemed to

be stronger, as indicated by the fact that the second readings on the samples, after they had stood in the icebox, showed that less hemolysis had occurred in the interval between readings. In our later tests we have discarded the rapid method entirely.

Discussion

With the points of technic discussed above provided for, the lack of agreement observed in table II has been eliminated and, as may be seen in table III, there is essential agreement between

Table III—*Herd test of June 17, 1929*

Serial Number	Animal Number	Agglutination Test — Amount of Serum (cc)						Complement-Fixation Test (New Antigen) — Amount of Serum (cc)					
		0.1	0.05	0.025	0.0125	0.00625	0.003125	0.05	0.025	0.0125	0.00625	0.003125	Single Tubes (0.05 cc)
1	297	+	+	+	—	—	—	C	C	C	C	C	C
2	215	+	+	+	+	p	—	2	2	2	C	C	2
3	383	—	—	—	—	—	—	C	C	C	C	C	C
4	281	+	+	—	—	—	—	C	C	C	C	C	C
5	197	+	—	—	—	—	—	C	C	C	C	C	C
6	343	+	+	+	+	+	—	4	4	4	4	4	4
7	327	+	+	+	+	+	—	4	4	4	4	2	4
8	321	+	—	—	—	—	—	C	C	C	C	C	C
9	241	+	+	+	+	+	—	4	4	4	4	2	4
10	247	+	+	+	—	—	—	C	C	C	C	C	C
11	234	+	+	+	+	—	—	2	4	3	2	C	3
12	319	—	—	—	—	—	—	C	C	C	C	C	C
13	290	+	+	p	—	—	—	C	C	C	C	C	C
14	235	+	+	+	+	p	—	2	3	3	C	C	3
15	229	+	p	—	—	—	—	C	C	C	C	C	C
16	349	+	p	—	—	—	—	C	C	C	C	C	C
17	329	+	+	+	—	—	—	C	C	C	C	C	C
18	293	+	+	+	+	—	—	2	3	2	C	C	3
19	341	+	+	—	—	—	—	C	C	C	C	C	C
20	348	p	—	—	—	—	—	C	C	C	C	C	C

the complement-fixation and agglutination tests. The animals on which the two tests do not agree are usually ones which have a titre of 1 to 80 in the agglutination test. Animals of this sort are considered positive by this method. Sometimes they are negative, at other times positive, to the complement-fixation test. On studying the records of the individual animals it will be observed that some of them fluctuate in their titres. Sometimes they react at 1 to 40 or are partial at 1 to 80, at others agglutination is complete at 1 to 80. These animals, therefore, are questionable

in their status. Some months, on the basis of the test of that particular month, they would be considered reactors and other months non-reactors. Such animals are invariably negative by the complement-fixation test. The hemolytic effect of the serum may be a factor here since such large amounts of serum may be employed without obtaining positive fixation. There is another group of animals having a titre of 1 to 80 in which this titre represents a fall, the animals being sometimes partial at 1 to 160 or complete at 1 to 160. These animals are positive in the complement-fixation test. The complement-fixation test, therefore, seems to be more clear cut in classifying animals as reactors or non-reactors. Animals which react in high dilutions (1 to 320 or 1 to 640) are also unquestionably positive to the complement-fixation test unless too much serum has been used in a single-tube test. While the complicated technic of the complement-fixation test seems to be a serious drawback to its routine use, it supplies rather valuable auxiliary information supplementing the agglutination test. No matter what method is used, there seem to be certain fluctuations which cannot be eliminated. When the two tests are applied simultaneously, sudden fluctuations may be more intelligently evaluated, since it is unlikely that the two tests would fluctuate radically in the same direction unless there were actually a change in the serum of the animal. This is of use particularly where a herd is being tested at rather long intervals. Where the interval of testing is short, this factor is of less importance, since the retest will soon either substantiate or deny the previous findings.

Summary

There are three points of technic in the complement-fixation test for the detection of *Brucella abortus* infection which, if not observed, may prove to be sources of error: (a) The antigen must be prepared free of substances in the culture medium on which it has been grown; (b) the amount of serum to be used in the test must be below the amount which interferes with the fixation of complement; and (c) cold fixation seems to be superior to rapid fixation at body temperature.

The agglutination and the complement-fixation tests agree very closely in the status of animals under test. Of the two, the complement-fixation test, as far as laboratory processes are concerned, seems to be more clear cut in classifying animals as reactors or nonreactors.

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Veterinarians Contribute to Farm Press

Veterinarians are beginning to realize the value of taking farmers and breeders into their confidence. They are also coming to realize that it is better to write articles on veterinary subjects than to allow this to be done by laymen. There is a demand for these articles, and, if publishers of agricultural papers can not secure them from veterinarians, they are going to get them some place else.

The Christmas number of *The New Breeder's Gazette* contained an article, entitled, "Why Have Mangy Hogs?" by Dr. Marion Imes, of the U. S. Bureau of Animal Industry. The November, 1929, issue of *The National Wool Grower* ran an article by Dr. W. J. Butler, state veterinarian of Montana, entitled, "Montana Veterinary Research Board," outlining the plans for conducting research in animal diseases. (Reported in the December issue of the JOURNAL.) In the January 16 issue of *The Idaho Farmer*, Dr. E. T. Baker, of Moscow, Idaho, has the feature article, "Mary's Lamb Followed Her Out West." In this contribution Dr. Baker very frankly discusses some of the problems that the western farmer has had to face and solve.

Undoubtedly there have been other articles published recently, of the same general character, that have not come to our attention.

Brenton Instruments Given to College

The veterinary surgical instruments which were the property of the late Dr. Samuel Brenton, of Detroit, Mich., have been given to the Michigan State College, Division of Veterinary Medicine, by Dr. Brenton's daughter, Mrs. A. P. Schiffer, of Detroit. Dr. Ward Giltner, dean of the Division of Veterinary Medicine at Michigan State College, is having an instrument case made, in which the instruments will be placed. The case will be appropriately marked.

THE TRANSMISSION OF SURRA BY SPECIES OF TABANUS

A Historical Review

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In January, 1928, an article was published, signed by W. G. T.[1] Later on, these initials were shown to designate Colonel W. G. Turner as its author. In this article the Colonel stated that certain far-reaching discoveries made by the Veterinary Officer (Kelser) on duty with the Medical Research Board, Manila, are well worthy of a more general description than they have hitherto received.

Turner stated that the officer concerned definitely determined that the fly known as *Tabanus striatus* is the chief insect involved in the transmission of surra. This discovery determined that the transmission was purely mechanical and that no part of the life cycle of the trypanosome was passed in the fly. The author stated further that these findings are of special importance, since, the main carrier being known, it is necessary only to avoid its breeding places and to take all possible precautions to keep down the number of insects in order to reduce greatly the incidence of the disease. He also indicated that the economic value of this discovery to the Philippine Islands and other tropical countries, as well as its great importance to the army, is only too apparent.

The above remarks led the reviewer to offer a corrective note in which attention was called to the first work by which *Tabanus striatus* was incriminated as a vector of the surra parasite, by Mitzmain.[2,3] This note was submitted to the Editor of the JOURNAL, who submitted it to Colonel W. G. Turner but did not publish it. This induced Turner[4] to state in another journal that "because of the rather limited scope of Mitzmain's experiments confirmatory evidence as to the part played by the *Tabanus striatus* should have been considered necessary and desirable and that the extensive work of Kelser in the outbreak of surra in 1926 did, in fact, supply the necessary additional facts. For this reason we felt that Kelser should be justly

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credited with having definitely determined that *Tabanus striatus* was the chief insect involved in the transmission of surra."

This manifest disregard of meritorious earlier work, universally recognized as fundamental, induced the reviewer to occupy himself further with the subject. The results of this excursion were so interesting and important, from a standpoint of the history of scientific research, that he felt warranted in laying his bibliographic findings before a larger circle of veterinary readers.

The natives of India had for ages suspected the flies, which they called "burra dhang" (*Tabanus tropicus* and *T. lineola*), as playing a part in the transmission of surra. In the Punjab the disease is known by the natives as "makki ki bimari" (horsefly disease).

The successful transmission of *Trypanosoma evansi* from sick to healthy animals by the horsefly was first reported by Rogers,[5] in 1901. He caught horseflies and permitted them to bite and suck blood of animals infected with surra. The blood of these infected animals contained trypanosomes in considerable or large numbers. The flies were then allowed to bite healthy animals (dogs and rabbits). Rogers found that when flies, which had just sucked infected blood, were immediately transferred to healthy animals, positive results were obtained.

Schat,[6] in 1903, was one of the first workers to find the surra parasite in the digestive tract of the Tabanidae.

The first work done in the Philippine Islands with biting flies (species not given) was that of Musgrave and Williamson,[7] and Musgrave and Clegg,[8] in 1903. They were successful in transmitting the Trypanosoma causing surra from infected animals to healthy ones (horse, dog, monkey, rat, and guinea pig) by biting flies. They proved also that animals protected from insects do not contract the disease, but that when protected against every other source of infection, except this one, trypanosomiasis occurred with the usual regularity.

Pease[9,10] in 1906, regarded the Tabanidae as being merely a mechanical means of transmitting the surra parasite from infected to healthy animals. He observed that surra occurs in exactly those localities which are the most favorable habitats for the Tabanidae and that outbreaks of this disease occur most commonly when these flies are most numerous, but that the most susceptible animals may live in these districts with perfect safety when they are not prevalent.

Lingard[11] observed *Trypanosoma evansi* in large numbers in the stomach of *Tabanus tropicus* after the flies were allowed to suck blood from animals infected with surra. He noted also that three healthy camels contracted surra in from nine to twelve days after having been bitten by *T. tropicus*.

In the Malay states, Fraser and Symonds,[12] in 1908, and Fraser,[13] in 1909, successfully transmitted surra, with four species of biting flies of the genus Tabanus (*Tabanus partitus*, *T. vagus*, *T. fumifer*, and *T. minimus*), from infected animals to a horse, dog, and rabbits. They also conducted experiments with a view of ascertaining whether or not part of the life cycle of *Trypanosoma evansi* was carried out in the body of the Tabanus. They found that trypanosomes, as such, are not found in the gastrointestinal contents of infected flies after 24 hours.

Leese,[14] in 1909, undertook to demonstrate the role played by biting diptera in the transmission of *Trypanosoma evansi* under natural conditions. He observed that out of six ponies kept in contact with the disease in a surra zone and in the surra season, four became affected with this malady. The two that remained healthy were protected from biting flies. This investigator made a survey of the insect population during the surra season.

Experiments were made also to determine the possible cyclic development of the surra parasite in insects. Consideration was likewise given to the mechanical transmission of surra by biting flies. A mechanical transmission experiment was conducted with two different species of Tabanus (species not determined). Wild flies (Tabanus) were caught on a camel infected with surra and immediately transferred to a white rat. The rat developed surra in twelve days after the first bites and five days after the last bite. Leese stated that he considered it as well established that the Tabanus is a most dangerous fly in the transmission of surra. In a subsequent paper[15], Leese supported the mechanical transmission of surra by biting flies and regarded the Tabanus as particularly dangerous.

This author noted that when Tabanus swarms in a locality to the same extent as the Lyperosia, practically no camel escapes becoming affected.

The next work to be discussed, dealing with the transmission of *Trypanosoma evansi* by insects, is that of Mitzmain. His investigations were made in the Philippine Islands and are probably the most exact and exhaustive of any worker up to the

present time, with the possible exception of Nieschulz, whose work will be considered later.

The fact that Turner[4] considered Mitzmain's investigations[2,3] rather limited in scope probably indicates that he was not acquainted with all of the work done by this investigator. Therefore the reviewer deems it desirable to discuss briefly Mitzmain's complete work on the transmission of surra by insect vectors.

Mitzmain's first contribution dealing with Tabanus in 1913, was on the biology of *Tabanus striatus* Fabricus.[2] In this paper he indicates that this horsefly is the most prevalent one in the Philippines. He also recognized its possible bearing relative to trypanosomiasis inasmuch as it is found wherever surra is abundant. It was noted that the seasonal distribution of this fly and the disease were, in a measure, coincident throughout the principal regions of the Archipelago.

Mitzmain found that in order to obtain eggs for study it was necessary to keep flies in captivity in a structure built for the purpose. This consisted of a capacious fly-proof building sufficiently large to house four to six large animals. In this enclosure carabaos were placed with thousands of flies. Within This building he made a very complete study of the details of ovipositing. Eggs were collected and observed microscopically during the entire process of hatching. The morphology and habits of the young larva of *T. striatus* were described in great detail. Consideration was given also to the general development of the young larvae, the ecdyses, and the morphology of the full-grown larvae. Very complete descriptions of the puparium, emergence from the puparium, and adult flies are given. This worker also described, in much detail, the feeding habits of the imago and the occurrence of *T. striatus*. It was noted that under experimental conditions this Tabanus bites usually not oftener than once in two days. As many as seven punctures may be made in a period of ten minutes with only a few seconds intervening between them. This insect is never satisfied with a single bite, but makes several punctures before a complete meal is obtained. All draft animals of the Philippines serve as hosts for *Tabanus striatus*.

Following the studies on the biology of *Tabanus striatus*, Mitzmain[3] published a preliminary paper on the mechanical transmission of surra by *Tabanus striatus* Fabricus. In this publication he reports experiments which were conducted during

the latter part of 1912 and the fore part of 1913, which tabanid flies, which were mostly bred from eggs, although in some instances the flies were obtained from larvae taken from their aquatic habitat and, in a few instances, captured adults were used.

In the series here reported, *Tabanus striatus* was used in sixteen experiments on the direct transmission of surra. The flies were first allowed to bite an infected guinea pig or horse for more than a minute and then transferred to healthy animals (4 guinea pigs, 5 monkeys and 6 horses) and allowed to complete their meal. An interval of from five seconds to three minutes intervened during the transfer from the infected to healthy animals.

Of the sixteen animals exposed, one monkey and two horses developed surra. The monkey infected was bitten by three laboratory-bred flies, and on one horse two laboratory-bred flies were employed while on the other horse six flies were used. In all the negative animals only one or two flies were permitted to bite.

In every instance the healthy animals were proved free of trypanosomes by rigorous segregation and frequent blood examinations. The mule and horses used in these experiments were kept from six to eight months in a fly-proof building prior to their use for exposure to fly-bites. The other species of animals used in these experiments were previously isolated in fly-proof cages and were declared surra-free after 90 days, during which time blood examinations were made once or twice weekly preceding the experiments.

Another experiment was made with one healthy and two infected carabaos in a large cage. The healthy animal was separated from the others by a coarse-meshed-wire partition. Flies were introduced daily into the common enclosure (in 43 days 2,087 tabanids were liberated) and given ample opportunity to bite the exposed animals. The healthy animals remained in a good state of health.

He made an experiment to determine whether or not there was any hereditary transmission of *Trypanosoma evansi* in these flies, which turned out to be negative. Attempts were made also to ascertain whether or not this trypanosome could be transmitted by the labellum of the horsefly, but he was unsuccessful in the conveyance of this parasite from abrasions of an infected animal through those in the skin of a healthy one. This investigator also conducted a series of experiments to determine the

maximum length of time that the trypanosomes remain alive and infectious in the gut of the fly.

Mitzmain continued his investigations on the transmission of surra with *Tabanus striatus* as a vector and, in 1914, he published his final work on the subject. In this paper he reports the results of mechanical transmission experiments which more nearly simulated the natural behavior of this bloodsucking gadfly. Two experiments bearing on this problem resulted successfully, both animals (horse and bull) showing undisputed evidence of surra.

Two additional experiments were conducted in order to show whether a single fly could transmit the disease. In the first one the tabanid was induced to feed with a maximum number of interruptions upon two hosts alternately. Successive applications, by means of a glass tube, were made on a surra-infected horse and a healthy one. The interval during the transfer was only a few seconds. In this manner each animal was bitten a total of 26 times in 35 minutes by the same fly. The healthy horse was then isolated in a screened stall and, after nine days, typical trypanosomes were found in its blood. The second trial with one fly was made with monkeys as donors. Here an interval of fifteen minutes was permitted between bites on infected and healthy hosts. This fly made only three distinct stabs with its proboscis into the skin of both monkeys. Six days after the biting, the healthy monkey showed a moderate number of organisms in the circulation. Fifteen days later, the animal was dead, and trypanosomes were found swarming in the heart-blood.

Mitzmain also made experiments to measure the length of time *Tabanus striatus* remains infective. Observations were made on not less than eleven animals. Of the seven healthy animals (2 monkeys and 5 horses) exposed within fifteen minutes after the flies had bitten an infected animal, five developed the disease. The four remaining animals did not contract the disease. They were exposed to the flies which had bitten infected hosts more than fifteen minutes before feeding on the healthy ones. An attempt was made also to find out if an infected fly, in biting, cleans its contaminated proboscis at a single insertion or if infective organisms are retained so that when interrupted in the biting process infection is carried to the next animal bitten. The data which Mitzmain obtained in one experiment led him to suspect that *Tabanus striatus* is innocuous after infecting one horse as a result of previous contaminations.

A well-organized series of indirect transmission experiments also was reported. In these experiments, flies were applied to horses at intervals of from one to two days up to 26 days after biting infected hosts, and in each instance with negative results. The results of these experiments were strengthened by inoculating flies, which were ground up with physiologic salt solution, into susceptible animals at various intervals, after biting the infected host. Dissection and microscopical examination for trypanosomes were made prior to the injections. No suspicious protozoan organisms were encountered in the flies dissected, and apparently no developmental forms were present in the flies, as the animals inoculated remained normal for one month following the experiments.

Mitzmain indicated that he personally investigated outbreaks of surra in five different localities and in every instance sufficient evidence was obtained to incriminate *Tabanus striatus* as a carrier responsible for the dissemination of *Trypanosoma evansi*.

The extensive laboratory experimentation and the epizoological studies of surra outbreaks induced Mitzmain to conclude that there is no evidence to support any possible biological development of the surra organisms relative to an intermediate host. However, the evidence was against the development of any latent infection.

Mitzmain also did a large amount of experimental work with arthropods other than *Tabanus striatus*. In 1912, he published investigations which dealt with the role of *Stomoxys calcitrans* in the transmission of *Trypanosoma evansi*.[16] In this paper he presents data obtained from 87 experiments in which thousands of Stomoxys were employed. In this contribution he reports experiments dealing with direct mechanical transmission of surra with flies which were induced to bite healthy animals under conditions which are similar to those occurring in nature, at various intervals. The interrupted method of feeding under laboratory conditions also was considered and the only positive result obtained was produced from a succession of 206 interrupted bites. The cyclic development of the surra parasite in Stomoxys, the question of hereditary transmission, and the possibility of infection being carried by the flies' pulvilli were studied. It was found that the last three methods mentioned played no part in the transmission of *Trypanosoma evansi*.

Mitzmain[17] published a complete report on the life history, feeding habits, longevity, and mating of *Stomoxys calcitrans*.

The methods employed in the keeping and feeding of the Stomoxys for laboratory purposes, and also that of applying this fly to a host in feeding, were given consideration.

In a large series of experiments, conducted in the Philippines, Mitzmain,[18] in 1914, was unable to transmit surra with several species of mosquitoes exposed to animals kept in screened stables and cages or by applying possibly infected mosquitoes by means of glass tubes, upon healthy animals. The matter of hereditary transmission was likewise disposed of in an experimental way. No infections resulted in these experiments. Transmission by mosquitoes also proved to be negative in the field.

Mitzmain[18] made detailed observations on the bionomics of *Lyperosia exigua*. He also conducted eighteen experiments on the transmission of *Trypanosoma evansi* by this fly from infected to healthy animals. Three methods were followed in the transmission experiments: First, three experiments were conducted by exposing healthy and infected animals to the bites of these flies, under natural conditions. These observations were made at the time of year when this species is more abundant than other bloodsucking flies. None of the healthy animals developed surra. Second, the experiment animals were exposed, in a screened stable, to the biting of a specified number of flies collected from known sources. In the first experiment two infected carabaos and a well one were exposed to more than 5,000 flies during a period of 24 days. In another experiment, the healthy carabao was isolated in a screened enclosure. During the course of a month, over 3,000 flies were placed on the sick carabao and transferred to the stall occupied by the healthy one. The blood of the healthy animals remained negative in both experiments. Third, thirteen interrupted feeding experiments were conducted on various animals. The laboratory-bred flies were transferred from infected animals to healthy ones, in test-tubes. In six experiments there was no appreciable interval between bites of flies on the infected and healthy hosts, and in the remaining seven experiments the time between bites varied from five hours to ten days. All animals used in these experiments remained in a good state of health. In an experiment with several thousand Lyperosia, the possibility of the transmission of *Trypanosoma evansi* hereditarily was eliminated.

Numerous mechanical transmission experiments were conducted with *Philaematomyia crassirostris*. The observations were made on guinea pigs and monkeys. Only one of these experiments

proved successful. In this trial 104 fresh laboratory-bred flies were applied to monkeys during six successive days. Six days after the last application of flies to the healthy monkey, a moderate number of trypanosomes appeared in the blood and, fourteen days after the onset of the disease, the animal died.

Hippobosca maculata was also used in surra transmission experiments. With this bloodsucking fly, thirteen experiments were made, twelve by the direct method of feeding and one by the indirect method. All of these experiments yielded negative results.

A total of eleven transmission experiments were conducted with the bloodsucking gnat, *Culicoides judicaudus*. Ten of the trials were by the direct method. In one of the direct transmission experiments, 326 gnats were permitted to bite infected and healthy hosts. The eleventh trial was by the indirect method. These experiments, likewise, proved to be negative.

The concluding work of Mitzmain[18] was that dealing with the role of *Musca domestica* in surra conveyance. In this work he first determined satisfactorily that this fly could harbor *Trypanosoma evansi* by numerous dissections and injections of saline suspension of abdominal contents of flies fed on abraded tails of surra-infected monkeys. After concluding the above observations with the house fly, attempts were made to simulate the normal relationship of parasitism in this fly and the stable fly by placing many of the two species of laboratory-bred flies in a common bottle and permitting them to attack an enclosed tail of a surra-infected monkey. After these flies had fed on the tail of this animal, it was withdrawn and the 250 house flies were placed in a fresh bottle containing 200 clean stable flies and the tail of a healthy monkey placed into the bottle. A similar experiment was conducted with two other monkeys and the same two species of flies, and three slightly modified experiments with guinea pigs. The five experiments yielded negative results. Five experiments were conducted to determine the possibility of carrying trypanosomes by the fly's feet. These experiments also were negative. Finally four experiments were made as controls. In these trials Stomoxys bites were followed immediately by rubbing in freshly drawn, virulent surra blood. These experiment animals, likewise, escaped infection. The practical significance of the conveyance of trypanosomes obtained by *Musca domestica* from the site of the punctures by stable flies to exposed wounds was finally investigated. Monkeys and horses

were used in the series. The house flies, after apparent engorgement of blood derived from the wounds caused by stable flies, were transferred to clean bottles and the abraded surface of a monkey's tail presented for completion of their meal. Four out of five attempts resulted in the positive transmission of *Trypanosoma evansi.*

Fletcher,[19] in 1916, in India, reports surra investigations in which they were able to transmit *Trypanosoma evansi* with two species of horseflies, *Tabanus albimedius* and *Tabanus striatus.* It was stated that it was possible to transmit the disease not only by interrupted feedings, but also by completed feedings. It was noted that *Tabanus albimedius* could transfer the infection up to 24 hours after biting an infected animal, and *Tabanus striatus* as long as 72 hours after feeding on an infected host. He stated that surra was not transmitted hereditarily to the progeny of infected females of *Tabanus striatus* and *Tabanus albimedius.*

In the Punjab, Cross,[20,21] and Cross and Patel[22,23,24] conducted a large number of transmission experiments with various species of Tabanus which were very common in this province. Cross reported the results obtained from experiments carried out during the fly season of 1922. The experiments with Tabanus consisted of two series, interrupted and uninterrupted feeding. Cross found that when the trypanosomes were present in the peripheral circulation at the time the flies took their meal, ten positive results were obtained from fifteen experiments. When these organisms were absent in the peripheral circulation at the period when the flies took their meal, only three positive results were obtained out of seventeen experiments. The period between the infected and healthy feeding was practically nil. In the eleven interrupted feeding experiments negative results were obtained in each instance. The interval between the infected and healthy meal varied from one to four days. The peripheral blood of the infected animals used in the uninterrupted feeding experiments contained trypanosomes.

Cross and Patel gave consideration to the bionomics of the flies used in the experiments. Several species of Tabanus were used, viz: *Tabanus albimedius, T. ditaeniatus, T. virgo, T. bicallosus, T. persis, T. hilaris, T. nemocallosus, T. rubidus,* and one unidentified species. These investigators reported interrupted feeding experiments. They experimentally proved that the following species of Tabanus are capable of bringing about direct transmission of camel surra: *T. nemocallosus, T. rubidus, T. hilaris,*

and *T. albimedius*. Of these, *T. nemocallosus* gave the largest number of positive results. These authors were successful in directly transmitting surra by interrupted feedings in seven instances. The disease was transmitted from an infected camel to a healthy dog, from infected guinea pigs to healthy guinea pigs and a rabbit. In these experiments the intervals between biting the infected host and healthy ones varied from 32 seconds to 24 hours. The number of flies used in the experiments varied from one to many. Cross and Patel state that direct transmissions appear to depend upon (1) that the fly feeding on a surra-infected animal be interrupted; (2) the interval between feeding on an infected and healthy animal; (3) the number of trypanosomes in the peripheral circulation of the infected animal at time of the fly bite; and (4) the number of flies; the larger the number of flies interrupted in their feeding on an infected animal and transferred to a healthy one, the greater the chances of transmission. These investigators also conducted many indirect transmission experiments with different species of Tabanus, but in no case was a positive result obtained. The intervals between feedings on infected and healthy animals varied from 10 minutes to 29 days. Experiments were likewise made to determine the length of time that *Trypanosoma evansi* remains alive in the gut of *Tabanus albimedius* by inoculating its contents into healthy rabbits. It was found that a positive result was obtained when the gut contents of one fly, eight hours after feeding on an infected animal, was injected subcutaneously into a rabbit. The contents of the digestive tract of flies, one to eighteen days subsequent to feeding on an infected animal, failed to produce disease in rabbits when inoculated subcutaneously. An experiment was made also to determine whether or not infection is carried through the eggs. Eggs obtained from a fly, which had fed on an infected host, were crushed and inoculated into a healthy animal. A negative result was obtained.

The next investigator to look into the transmission of surra by Tabanus and other insects was Nieschulz. The investigations of this worker and his associates led to a series of not less than nineteen zoological contributions to the knowledge of the surra problem. Nieschulz's first contribution[25] (1925) reported the successful transmission of surra by Tabanus. He succeeded in transmitting mechanically *Trypanosoma evansi* from horse to horse with *Tabanus stantoni* and *T. ceylonicus*. Twenty-five individuals were used, and the act of sucking was interrupted

from one to fifteen minutes. Attempts to transmit surra directly with two to three specimens of *T. stantoni*, and with eight *T. stantoni* and four *T. ceylonicus*, with an interval of ten hours between feedings on infected and healthy animals, were unsuccessful.

The next publication by Nieschulz appeared in 1926.[26] It was here reported that he was able to transfer, by direct transmission, surra from horse to horse with two specimens of *Tabanus rubidus*. The intervals of time between biting infected and healthy animals varied from one to two minutes. He succeeded also in transmitting the disease with 118 flies of the above species of Tabanus. These flies sucked blood from an infected animal one, two and three days before feeding on a healthy one. An infection was likewise brought about with one individual of *Tabanus striatus*, after an interval of two minutes between feeding on infected and healthy animals. In this paper Nieschulz indicated that transmission depended upon the intensity of infection, number of flies biting, and the interval between feedings on a surra-infected animal and a healthy one. He further suggests that the possibility of transmitting the disease is not very great after one-half hour from the time the flies bite an infected animal.

During the years 1924 and 1925, Singh[27] made 116 transmission experiments with four different species of horseflies. He conducted interrupted and uninterrupted feeding experiments with each of the four species of Tabanus on white rats, rabbits and dogs. The experiments were divided into two groups: one where the flies were allowed to feed on surra-infected animals with trypanosomes in the peripheral circulation; in the other group, feedings were made on a surra-infected animal not showing trypanosomes in the peripheral circulation.

With *Tabanus bicallosus*, 47 experiments were made, 33 interrupted and 14 uninterrupted feedings. Of the 33 interrupted feeding experiments, 25 were made when trypanosomes were present in the peripheral circulation of the infected animals. Of the 25 experiments, seven gave positive results. The number of flies used varied from two to seven per experiment. In the remaining eight interrupted feeding experiments, the flies were permitted to bite infected animals which showed no trypanosomes in the peripheral circulation. These experiments yielded negative results. Fourteen uninterrupted trials also were made with this fly. All of these experiments resulted negatively. Thirty-two

experiments were carried out with *Tabanus virgo*. In this interrupted group of experiments, fourteen were made with flies biting an infected animal showing trypanosomes in the peripheral circulation. Three of this group proved to be positive. Five additional interrupted feeding experiments were made. In this series the flies fed on an animal infected with surra but which did not show trypanosomes in the peripheral circulation. These trials proved to be negative. In thirteen uninterrupted feeding experiments with *T. virgo*, all turned out to be negative. Another fly, *Tabanus hilaris*, was used in nineteen transmission experiments. Negative results were obtained in this series of experiments. Singh remarked that these flies were transported a long distance and that only a few of them were able to feed and these did so in an unsatisfactory manner. He concluded, therefore, that the relation of this fly to the transmission of surra required further investigation. The last fly to receive consideration by Singh was *Tabanus ditaeniatus*. This Tabanus also was transported a great distance to the laboratory, and out of the hundreds of flies collected, only eighteen were fit for experimentation. With these flies he made eighteen interrupted experiments. Thirteen of the trials were made by permitting the flies to feed on infected animals showing the surra organisms in the periphery. Out of this group only two proved to be positive. The number of flies used in each experiment varied from one to five individuals. The remaining five experiments, in which the trypanosomes were absent in the peripheral blood of the infected host, all turned out to be negative. The number of flies used varied from two to four flies per experiment.

In subsequent papers Nieschulz,[28] and Nieschulz and Ponto,[29,30] in 1927, reported transmission experiments with not less than six different species of horseflies. He successfully transmitted *Trypanosoma evansi* in direct, mechanical transmission with *Tabanus rubidus*, *T. striatus*, *T. immanis*, *T. ceylonicus*, *T. flavivittatus*, and *T. brunnipes*. Nieschulz and Ponto reported that they were successful in infecting three hosts experimentally, in succession, with *Tabanus rubidus* (same individual). Similar experiments were made also with *T. striatus*. Nieschulz and Ponto stated that, with a relatively small number of specimens of this Tabanus, it was not difficult to transmit surra to three guinea pigs, one after another.

The next contribution dealing with the transmission of surra is that of Kelser,[31] in 1927. Since it was made to appear by

Turner[4] that Mitzmain's experiments were rather limited in scope in comparison with those to which he called attention, the reviewer was tempted to examine the latter also. The portion of this report relating to *Tabanus striatus* is based on work done during an outbreak of surra, in August, 1926, among horses and mules at the United States Army Post located about eight kilometers from Manila. In this epizootic the disease was studied under natural conditions and an epizoological study was made. The data obtained from the study of this outbreak furnished evidence of the part that *Tabanus striatus* played in the spread of the disease. A detailed description of the outbreak was given. In addition to the study of the above-mentioned outbreak of surra, Kelser also made a few transmission experiments with *Tabanus striatus* in the laboratory to substantiate his epizoological findings. For the first experiment eleven wild flies were given an opportunity to feed on a normal white rat. Each fly was applied to the rat separately by means of a test-tube. Of the eleven flies, only five bit the rat and sucked blood. Eleven days following the fly bites, the rat was found to contain trypanosomes in its blood, and four days later, it was found to be dead with surra. A number of flies which did not bite the normal rat were killed and their stomach contents examined microscopically. In the stomach contents of one of the flies, Kelser found trypanosomes which were morphologically indistinguishable from *Trypanosoma evansi*. Following the surra outbreak at Fort McKinley, additional transmission experiments were made with laboratory animals. For these experiments eight wild female flies of the species *Tabanus striatus* were captured on the Fort McKinley reservation and fed back and forth on a guinea pig infected with surra and on three healthy white rats. Two of the three rats developed surra, one on the eleventh day following the fly bites and the other on the twelfth day. Both rats died of the disease, one dying four days after the trypanosomes were detected in the blood and the other on the sixth day.

Kelser, with a view of demonstrating that *Tabanus striatus* transmits surra only in a mechanical way, used the eight flies mentioned above in another experiment. After these flies had fed back and forth in the three previous experiments, he gave them an opportunity to feed on another normal rat on subsequent days, but these feedings were not preceded by biting an infected animal. This was continued up to the eighth day, when the last fly died. Only five of the eight flies bit the healthy rat during

this period. The rat was observed over a period of several months, at the end of which time there was no evidence of surra. When this animal was inoculated with surra blood, it promptly developed the disease. The results obtained by Kelser in his studies led him to conclude that the common disseminating agent of surra among equines, in the Philippine Islands at least, is *Tabanus striatus* and the mode of transmission is purely mechanical.

Kelser also did a limited amount of work with other probable vectors of *Trypanosoma evansi*. He conducted four experiments with *Stomoxys calcitrans*. Laboratory-bred flies were used in three of these experiments. In three of the experiments consideration was given to the possibility of this fly transmitting surra mechanically. In the other experiment, the question of cyclic development was considered. The number of flies used in these experiments varied from 15 to 30 per experiment. In some cases, flies bit two or three times before completing their meal. Negative results were obtained in these trials.

The next fly considered by this author was *Lyperosia exigua*. Four experiments were made also with this insect. In one experiment wild flies were used and in the remaining trials laboratory-bred flies were employed. Interrupted feedings were made in three of the experiments. In these trials the flies were permitted to feed back and forth on an infected and healthy white rat on each of two or three consecutive days. The number of flies used per experiment varied from 25 to 27. In the fourth experiment, attention was paid to the question of cyclic development of the surra parasite. Thirty laboratory-bred flies were used in this trial. These flies, after feeding on an infected host, were fed daily on a healthy rat over a period of nine days. The four experiments yielded negative results.

A series of three experiments with laboratory-bred mosquitoes (*aëdes aegypti*) also were reported. In two instances, Kelser was able to transmit the *Trypanosoma evansi* from a surra-infected white rat to a healthy one. In one of the experiments, ten mosquitoes were fed back and forth on sick and healthy rats. Some of the insects bit six or seven times before becoming engorged. The mosquitoes were fed as often as they would bite during a period of eight days. The normal rat showed trypanosomes in its blood sixteen days subsequent to the first bite and died six days later. The second positive result was obtained with six mosquitoes. They were fed back and forth, from sick to

healthy rats, for a period of six days. Eighteen days after the initial feedings, the normal host was found to have trypanosomes in its blood-stream and death occurred eight days later. In another trial an attempt was made to determine whether this parasite undergoes a cyclic development in the mosquito. This experiment resulted negatively. Two species of ticks also were used in surra transmission experiments. In these experiments consideration was given to the mechanical and hereditary transmission of *Trypanosoma evansi*. Negative results were obtained.

Two more articles by Nieschulz[32,34] made their appearance after the publication of Kelser's observations. Since one of these contributions was submitted for publication June, 1927, and the other in August of the same year, the reviewer considered it desirable to include these papers in the review. Nieschulz[32] reported that it was possible to infect mechanically several experiment animals, one after another, by the Tabanus. He infected two horses, one after the other, with 22 individuals of *Tabanus rubidus* by direct transmission. He was successful also in transmitting *Trypanosoma evansi* from surra-infected horses to healthy guinea pigs with *T. rubidus* in five out of six experiments.

The last paper to be reviewed is the contribution by Nieschulz,[34] made in 1928. In this article he reports 90 new experiments which were carried on with 3810 individuals of *Tabanus rubidus*. In a series of 28 direct transmission experiments, with a single fly per experiment, with intervals of from one second to one minute, Nieschulz was successful in transmitting the surra organism, from an infected horse to cavias and mice, 21 times. At an interval of one-half hour it was noted that five out of eight experiments yielded positive results. With an interval of one hour between biting infected and healthy animals, two out of five experiments gave positive results. After a two-hour interval, one in five experiments was successful with 20 individuals per trial. With a three-hour interval between bites, two out of six experiments were positive. After an interval of four hours, Nieschulz transmitted the surra organism in one out of six experiments. Over 300 flies were necessary to bring about this infection in a horse. After a six-hour interval, 500 of these horseflies were necessary to bring about an infection. Experiments with intervals of more than six hours between feedings on infected and healthy animals resulted negatively. Nieschulz

also found that a direct transmission to two animals experimentally, one after another, was somewhat easily brought about. Out of nine such trials, he was successful in transferring the infection to two animals in each of three experiments. In three other experiments only one animal contracted the disease.

These results induced Nieschulz to conclude that the direct transmission of *Trypanosoma evansi* is readily brought about, and that the prospect of infection rapidly decreases when the interval between feeding on infected and healthy animals is increased.

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Extensive Tuberculosis in Swine

One of the most badly infected shipments of swine that has ever come to the attention of the federal Bureau of Animal Industry was recently received at National Stock Yards, Ill., from central Missouri. Out of a lot of 88 head slaughtered, 68 were condemned as unfit for human food and five passed with restrictions, leaving only 15 straight food hogs in this lot. The age of the animals averaged approximately 10 months. The animals were traced, with the result that the breeding cattle and swine on the farm of origin were tuberculin-tested. Out of 17 cattle tested there were three reactors. Thirteen brood sows and ten shoats also were tested, but no reactors disclosed. Such cases as this usually follow the feeding to swine of carcasses of cattle which have died because of being extensively affected with tuberculosis. However, no such history could be obtained in this instance by the veterinarian who investgiated the case, according to a report made by the Tuberculosis Eradication Division.

Virginia Inaugurates Veterinary Conferences

The Department of Zoology and Animal Pathology of the Virginia Polytechnic Institute, at Blacksburg, has joined the list of state institutions which are holding annual veterinary conferences. The first Virginia conference was held at Blacksburg, January 27-31, 1930. An interesting program was provided. Among those who contributed to the program were Dr. T. H. Ferguson, of Lake Geneva, Wis., president of the A. V. M. A.; Dr. W. R. Hobbs, of the Department of Veterinary Surgery, Ohio State University; Dr. H. C. Givens, state veterinarian of Virginia; Dr. William Moore, state veterinarian of North Carolina; and members of the staff of the Department of Zoology and Animal Pathology.

SKELETAL DAMAGE IN BROOD SOWS

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The following cases occurred in brood sows during advanced pregnancy or soon after farrowing. There was no history of external injury in any case.

Case 1: A five-year-old sow, weighing approximately 500 pounds, became paralyzed during late pregnancy. The only symptom she was seen to show, previous to the onset of paralysis, was stiffness in moving. This symptom was noticed several weeks before she went down. The sow was fed a ration of yellow corn, ground oats, tankage and minerals. After the animal went

FIG. 1. Fracture of neck of femur of brood sow, causing the loss of the use of the hind limbs.

down she showed loss of appetite, rapid respiration and an elevation of temperature for a period of three or four days. At the end of another week she gave birth to nine full-term pigs which were either born dead or died soon after birth. The paralysis did not show improvement after the pigs were born; and the sow was killed ten days later.

Autopsy: No significant lesions were found except in the skeleton. The second to the eighth dorsal vertebrae, inclusive,

were solidly ankylosed and their bodies were greatly thickened by dense bone. There was a dislocation between the eighth and ninth dorsal vertebrae. The ninth and tenth dorsal vertebrae were firmly ankylosed; and there was a slightly spongy exostosis on the ventral surface of the second and third dorsal vertebrae, and also one on the left side of the body of the eighth vertebra. The other vertebrae appeared to be normal except that there was an ankylosis of the second and third lumbar vertebrae. The posterior portion of the sacrum was twisted slightly to the left and bent downward. The left ischium was considerably thickened and its surface markedly roughened immediately anterior to the tuber ischii.

Case 2: A large sow, which had recently farrowed at full term. She had been kept in a barn for three or four weeks and

FIG. 2. Ankylosis of the spine in a brood sow and subsequent dislocation, which caused sudden paralysis of the hind parts.

had been fed yellow corn and some skim-milk. She suddenly became "paralyzed" in the hind parts. After a few days, the sow learned to move about to some extent by means of the fore legs, but did not regain the use of the hind limbs.

The animal was killed and the postmortem examination showed a complete transverse fracture of the neck of the left femur. There was no fracture or distortion found in any other portion of the skeleton. The cortex of the shafts of the long bones, however, appeared thinner than normal.

Case 3. Involved three large sows, which became "paralyzed" in the hind parts during advanced pregnancy or soon after farrowing. The sows had been kept inside of a barn for several weeks and had been fed corn and skim-milk.

Two of these sows were examined postmortem and were found to have fractured femurs. In one animal both femurs were fractured, while in the other, one femur was fractured. The fractures were all in the shafts of the bones.

Discussion

In these cases there were two distinct types of skeletal changes which ultimately produced quite similar clinical effects. In the first case there was an osteo-arthritis of the vertebral column which produced ankylosis and finally resulted in a dislocation. The paralysis, of course, resulted from injury to the spinal cord. In the other two cases there was an abnormal fragility of the bones which resulted in spontaneous fracture of the femur. In large brood sows it is quite difficult to distinguish, clinically, between broken femurs and a fracture or dislocation of the spine.

The osteo-arthritis in the first case was of obscure origin. The abnormal bone fragility of the other two cases, however, was evidently caused by inadequate rations and inside confinement.

HYGROMA OF THE KNEE OF A BULL WITH EXTENSIVE PERIARTICULAR EXOSTOSIS

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A large Holstein bull, with a history of having an enlarged right knee, since a small calf, was brought to the clinic for treatment. A clinical diagnosis of hygroma was made and an unfavorable prognosis given. The owner, later, decided to send the bull to the abattoir, where an autopsy was made.

A large, firm swelling about eight inches wide and twelve inches long covered the anterior surface of the right carpus and extended well down on the metacarpus. A longitudinal division revealed a chronic abscess, with very dense fibrous walls one and one-half inches thick, and a central abscessed cavity five inches long and three inches wide which contained approximately a quart of thin, grayish, watery pus and many small pieces of loose necrotic tissue. The articular surfaces of the carpal and metacarpal bones appeared not to be involved. Upon further dissection several pieces of bone were encountered in the thick capsule. The entire part was autoclaved and boiled in order to remove the softer structures and expose the bone. In all, there were about

FIG. 1. Longitudinal section showing the thick capsule with the central abscessed cavity.

FIG. 2. The carpus and metacarpus showing extensive periarticular exostosis together with the several pieces of bone found in the fibrous capsule.

a dozen pieces of spongy bone which ranged from one-quarter of an inch up to an inch and a quarter in diameter. There was also a large exostosis on the anterior surface and medial and lateral borders of the heads of the metacarpal bones.

A microscopical examination was made of the tissue comprising the capsule. This examination showed much granulation tissue with excessive vascularization.

PULMONARY ACARIASIS IN THE MONKEY*

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In the early part of May, four monkeys (*Macaca rhesus*) of a recent importation were obtained from a pet-shop. Soon after arrival, one of them died from obscure causes. At necropsy the

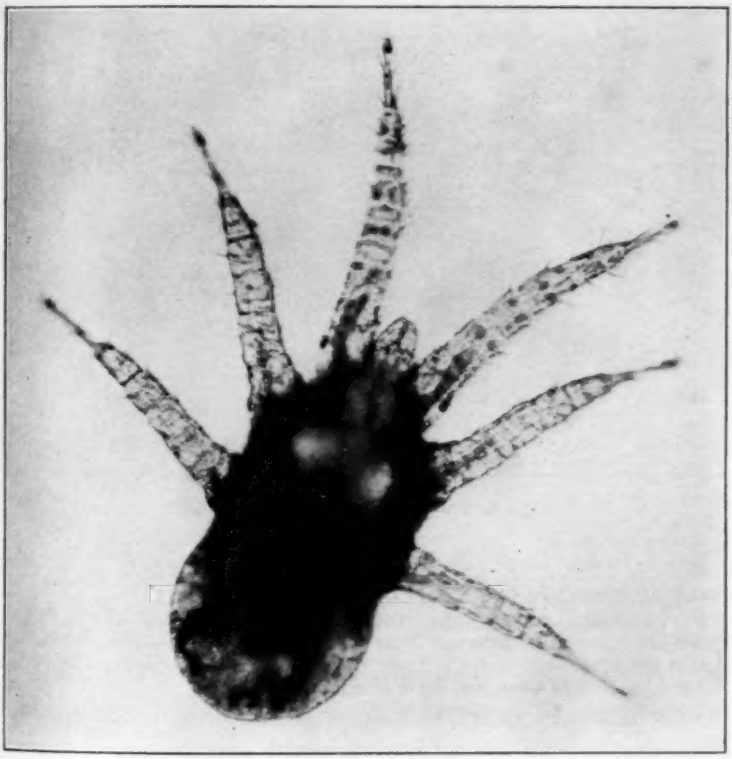

FIG. 1. Larval form; dorsal view of pulmonary mite found in monkey.

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FIG. 2. The carpus and metacarpus showing extensive periarticular exostosis together with the several pieces of bone found in the fibrous capsule.

capsule with the central abscessed cavity.

only lesions found were in the lungs in which there were small, isolated areas of marked congestion. Palpation revealed small nodules from 5 to 10 mm. in diameter. When opened, many were found to contain masses of whitish material, which, when examined microscopically, proved to be composed of large numbers of small mites. According to Ewing (1929),[1] pulmonary mites (*Halarachne americana* and *Halarachne attenuata*) have

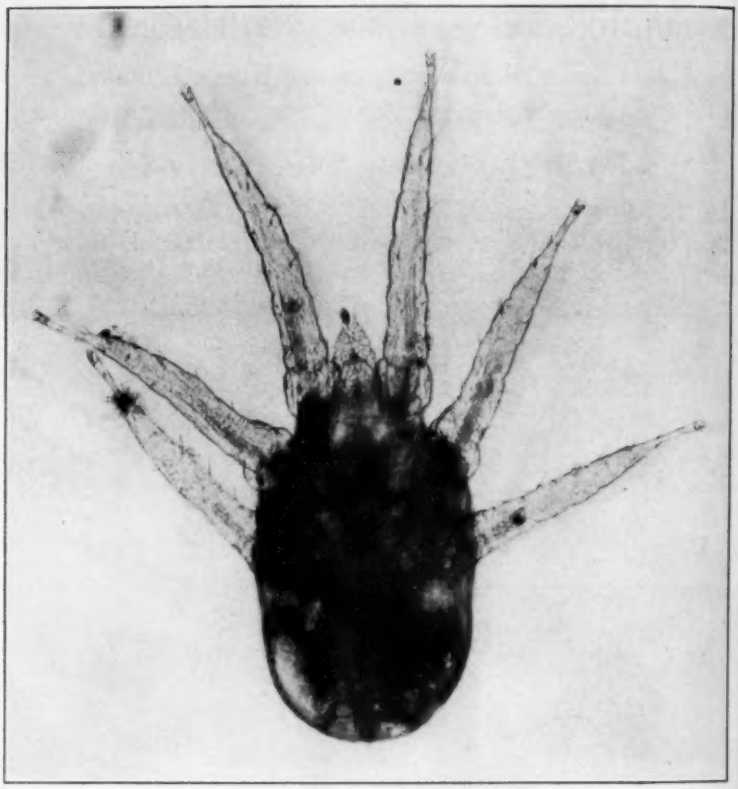

FIG. 2. Larval form, ventral view of mite.

been obtained from seals. Regarding pulmonary mites of monkeys, he made the following statement:

> Pneumonyssus species infest the lung of certain Old World monkeys. They are somewhat different from the lung mites of seals, and have no dorsal shield on the body. They occur in small cavities in the lungs. Their habits have been but little studied.

As far as we are aware, an infestation with the pulmonary mite of the monkey has not been recorded previously in America. Consequently, we are reporting the data that we have obtained from one case.

Both larval and adult mites were recovered from the lungs. The larvae were small, hexapod forms about 0.5 mm. long and about 0.3 mm. in their greatest diameter. A slight indentation, which indicates the line of demarcation between the thorax and abdomen, may be observed in the larvae but not in the adults (figs. 1 and 2). The adult form, which is about 0.95 mm. long and

FIG. 3. Adult form, dorsal view of mite.

0.48 mm. wide, possesses four pairs of legs which are relatively short as compared with those of the larvae. The body is ovoid, broad posteriorly, and tapers gradually anteriorly. The region of greatest diameter occurs in the posterior third of the body (fig. 3). We are unable to determine the species of this parasite,

but since it was recovered from *Macaca rhesus*, an Old World monkey, it probably belongs to the genus Pneumonyssus.

A description of the pathologic changes present in the lung of the monkey is of interest because it is probable that the parasite is a factor in the production of the condition. Microscopically, there was an area of marked congestion surrounding each nodule. Many of the large nodules contained mites only, but the smaller nodules were mostly filled with necrotic tissue. These small abscesses were being walled off by a fibrous layer which was surrounded by a zone of leukocytic infiltration. Adjacent to this zone there were small areas in which there was evidence of interstitial pneumonia.

We are placing our findings on record in the hope that they will stimulate other workers to be on the lookout for infestations with this parasite.

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MALFORMATION OF THE LARGE INTESTINES AND VISCERAL BRANCHES OF THE ABDOMINAL AORTA IN A BULL CALF

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A bull calf, thirty-six hours old, having atresia of the anus, was brought to the clinic for treatment. As no rectum could be palpated through the surgical opening that had been made, the calf was destroyed and autopsied.

There was an excessive amount of dense connective tissue in the pelvic cavity, which made it impossible to palpate the rectum. A comma-shaped, tubular large intestine, eighteen inches in length and three inches in diameter, the blunt point of which projected into the pelvic cavity, was continuous with the small intestine. The visceral mesentery was represented largely by a tense cord-like structure twenty-four inches in length, which extended from the visceral surface of the liver to the junction of the small and large intestines. From this cord-like portion the small intestines were suspended by mesenteric folds, one-half to three inches in length. Other body organs appeared normal.

The dissection of the blood-vessels supplying the abdominal organs revealed the following: The coeliac artery was given off

FIG. 1. This figure shows (1) the tense cord-like mesentery; 2, the comma-shaped large intestine. The four divisions of the stomach are seen in the upper left-hand portion, with the duodenum extending downward, and including part of the pancreas at its first turn. To the left of this area is the liver, while below the latter, a part of the abdominal wall is shown, including the umbilicus and round ligament to the liver.

from the abdominal aorta in the usual manner. There were no mesenteric arteries originating directly from the latter, but substituted for them was a medium-sized artery which branched off

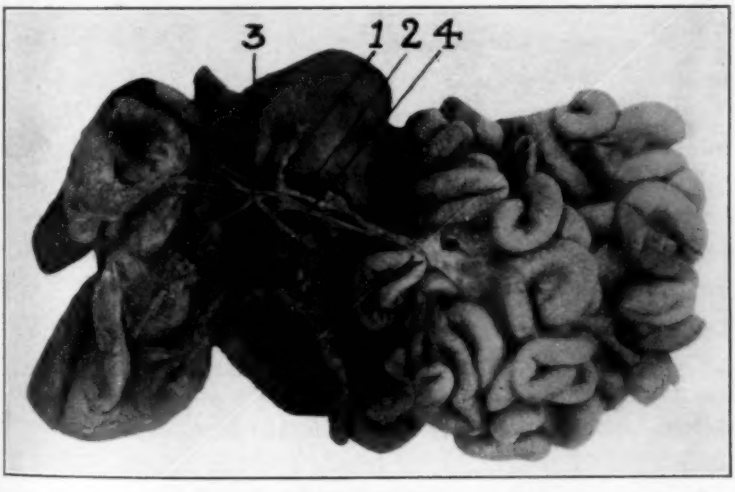

FIG. 2. 1, coeliac artery; 2, branch from the coeliac, supplying the large and small intestines; 3, terminal branches of the coeliac, passing to the various abdominal viscera; 4, 4, portal vein.

the coeliac an inch and a half down its trunk. It supplied both the large and small intestines. This artery, together with veins, formed the cord-like portion of the mesentery. After the intestinal branch left the coeliac artery, the remainder of the artery was distributed to the various abdominal organs.

LIVER LESIONS IN JOHNE'S DISEASE

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The two cases herein reported occurred in aged animals, the first case was a Holstein cow, eleven years of age; the second a Jersey bull, seven years of age. On account of typical, clinical histories, both animals were destroyed in spite of the fact that they had failed to react to the johnin test. Upon autopsy well-marked lesions were observed in the small intestines in both cases. The adjacent lymph-glands were enlarged in one case, and atrophic in the other. Gray foci, which upon microscopic study proved to be lesions of Johne's disease, were frequently found in the cortical portion of the lymph-glands. These foci were somewhat larger, but in other respects resembled germinal centers. No unheralded difficulties were experienced in isolating the Johne's bacillus from the lymph-glands of the second case.

In the intestine and adjacent lymph-glands the histopathology was found to be similar in most respects to the microscopic changes which have been described by M'Fadyean.[1] However, a microscopic study of sections of the livers revealed many focal lesions which were unquestionably of metastatic origin. These foci consisted of from one to three giant cells of the Langhans type, surrounded by a narrow zone of proliferated reticulo-endothelium. A few lymphoid cells were scattered around the periphery of the lesions and had infiltrated into the deeper portions to some extent. In keeping with the primary lesions there was no evidence of caseation. In some places the lesions were found in the hepatic trinities, but as a rule, they were generally located about midway between the periphery of the lobule and the central vein. The presence of acid-fast organisms within these lesions was demonstrated with considerable difficulty; whereas, large numbers of

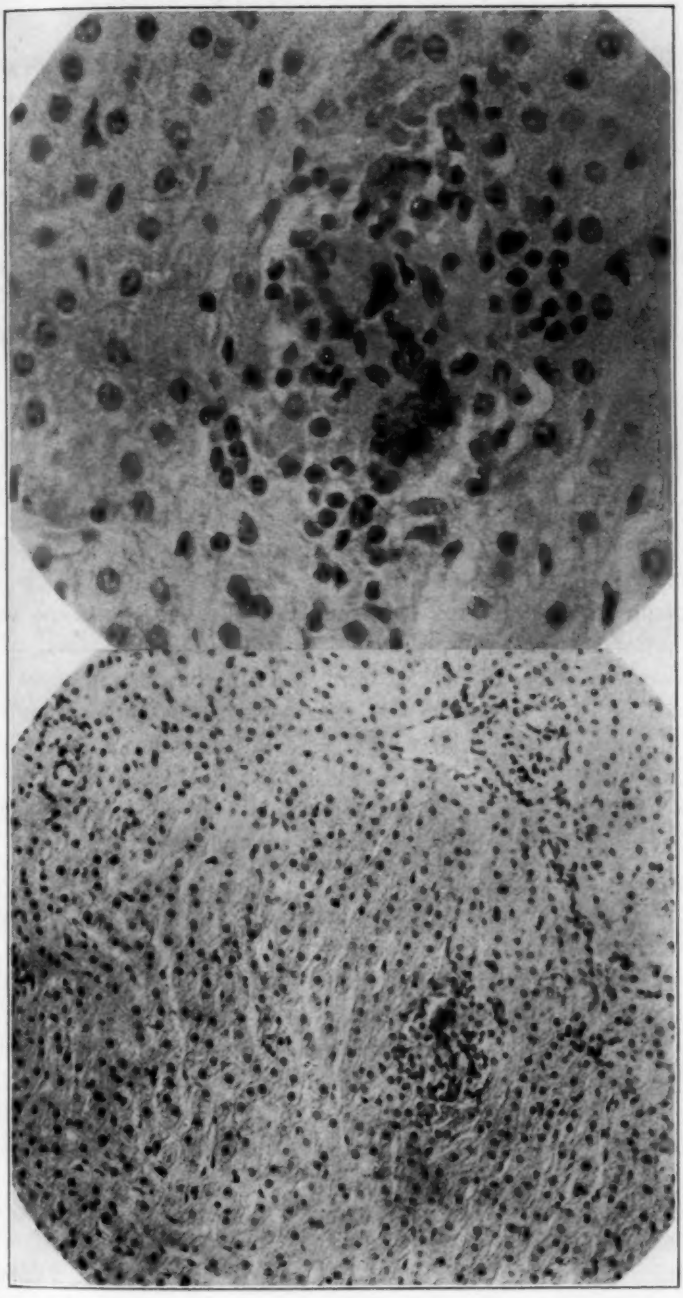


FIG. 1 (Above). Lesions observed in the livers of advanced cases of Johne's disease; foreign-body giant-cells, slight proliferative changes and some round-cell infiltration.

FIG. 2 (Below). A higher magnification of the lesion in fig. 1.

the causative organism were readily demonstrated in sections from either the lymph-glands or intestines.

REFERENCE

[1]M'Fadyean, Sir John: Jour. Comp. Path. & Therap., xxxi (1918), p. 73.

BACTERIUM VISCOSUM EQUI INFECTION IN FOALS OF THE HEAVY BREEDS

By J. F. Bulliard, *Lafayette, Ind.*

Department of Veterinary Science

Purdue University Agricultural Experiment Station

This report concerns two cases of joint-ill occurring in foals of the heavier breeds of horses due to *Bacterium viscosum equi.*

The first foal was foaled September 10, 1929, at 2:00 a.m. The first noticeable symptoms appeared at 6:00 p.m., September 11. When first examined at 8:00 p.m., the foal was unable to rise, sweating profusely, and continually groaning. Extreme weakness, prostration and dyspnea were well pronounced. The temperature was 102.6° F., and the mucous membranes congested. Extensive edema was present in the right hind leg from the ankle up to and including the hock. Stimulant treatment in the form of aromatic spirits of ammonia, two drams in two ounces of the dam's milk, was prescribed. On September 12, the foal died at 6:00 a.m., just fifty-two hours after birth.

Autopsy revealed the following: The lungs congested with several scattered areas of emphysema. The heart showed many subepicardial petechiae, especially in the coronary grooves. The liver was darker and firmer than normal, and much thick, dark blood exuded from the cut surfaces. The fat surrounding the capsule of the kidney showed a slight edema. Upon longitudinal section the cortex and medulla appeared to be darker than normal. The outstanding lesions were many small pin-point, grayish foci, uniform in size and well distributed throughout the cortex. A moderate amount of thick, cloudy viscid mucus was seen in the pelvis. The spleen was slightly enlarged but otherwise appeared normal. The intestines also appeared normal. The intestinal contents consisted of a small amount of thick, yellowish mucus. The stomach showed a slight catarrhal gastritis. The hip and hock joints were distended with much thick, yellowish-brown and blood-stained fluid which contained a considerable number of grayish-white flocculi. The right hock especially was

very greatly distended. The remaining joints were nearly normal, only a slight discoloration of the fluid was noticed. The right hock, fetlock and ankle joints were cultured. All yielded pure cultures of *Bacterium viscosum equi.* Likewise, this organism was found in a pure state in the umbilical vessels, heart, kidneys, liver and spleen. The fetlock joint, while showing less pathological change than any of the other joints, gave the most luxuriant growth of the organism.

Foal 2 was foaled September 18, at 12:30 a.m. At 10:30 a.m., the foal's temperature was 101.2° F., pulse 120 and respirations 80, appetite good, mucous membranes congested. The hock joints were slightly enlarged. The most noticeable symptom was the extreme nervousness, which was manifested by the foal continually walking around the stall and repeatedly lying down and getting up. Extreme weakness developed at 4:30 or two hours before death, which occurred at 6:30 p.m. This foal lived only eighteen hours.

The postmortem of this foal showed only slight pathological lesions as compared to the first case. There was a moderate amount of congestion in the abdominal viscera. The kidneys did not show any macroscopic abscesses in the cortex, but the pelvis contained a moderate amount of thick viscid mucus. The heart was apparently normal and the lungs showed a slight congestion. The joints were nearly normal. There was a slight increase in the amount of fluid, which was slightly viscid and was deep amber in color. The hock joints, liver, spleen, heart, kidneys and umbilical vessels all yielded pure cultures of *Bacterium viscosum equi.*

Conclusions

As far as can be determined, the two above cases are the first ones to be reported in this country as occurring in foals of the heavier breeds of horses.

Up to the present time, cases of this disease that have been reported have occurred in the light breeds of horses, principally the Thoroughbred. One exception to this was a case of a foal out of a trotting mare, reported by Udall, Fincher and Gibbons, of Cornell University. The cases in Thoroughbreds have all been reported from the Kentucky Station, by Dimock and his associates.

The two cases herein described represent the third locality in the United States in which this infection has been reported.

This report emphasizes the fact that veterinarians in all horse-breeding localities should be on the lookout for this infection, as the lesions produced may be very easily overlooked. For this reason more thorough examinations should be made of all foals that die during the first few days of life. If this is done, it would very probably be shown that this disease is more widely disseminated than has heretofore been believed.

Jail for Parrots

The recent appearance of cases of "parrots' fever" in various countries has led to exaggerated dread of the disease. There seems to be danger of a widespread massacre of guilty and innocent parrots alike.

Authorities agree that there can be no danger from birds long resident in this country who have not fraternized with recent immigrants. Yet many are anxious to get rid of parrot pets. Rumor has it that within recent days parrots have been seen flying wild in Central Park, left there by that strange specis of kind-hearted humanity who can not bear to kill a pet—or arrange to have it mercifully destroyed—but who willingly abandon it.

To save the birds of timorous owners, Sing Sing has offered shelter to parrots of all kinds. According to Warden Lawes, "the inmates here think this talk about parrot fever is nonsense." Any parrot condemned to death on a remote suspicion of psittacosis may have his sentence commuted to life in Sing Sing.

The prison birdhouse already shelters ten parrots. It is to be hoped that the warden's generous offer will not evoke such a response that spare perches and free wing-room will be taxed to the limit and a new problem of prison congestion arise.

—*New York Times.*

Tuberculosis-Free Counties

Cook County, Minnesota, has attained the distinction of being the first county in the Middle West where all the cattle have been tuberculin-tested and no reactors found. Montana has one such county, Mineral, located in the western end of the State. The county was free not only on the initial test, but was free also on the reaccrediting test. Twelve counties in North Carolina were free of tuberculosis on the initial test.

DOES REARING CHICKS IN CONFINEMENT AFFECT THE RED CELL OR HEMOGLOBIN CONTENT OF THEIR BLOOD? L. P. Doyle, F. P. Mathews and Roy E. Roberts. Poultry Science, ix (1929), 1, p. 6.

No significant differences were found in the red cell or hemoglobin content of the blood of chicks under the following conditions: kept inside and irradiated by means of a mercury-vapor quartz lamp; fed cod-liver oil and irradiated; and exposed to direct sunlight. There was no appreciable difference in the hemoglobin or red-cell content of the blood of male and female chicks. A relatively high mortality was associated with the feeding of cod-liver oil.

TULAREMIA RESEMBLING SPOROTRICHOSIS. B. Shelmire. Arch. Dermat. & Syph., xix (1929), p. 918. Abst. in Arch. Path., viii (1929), 6, p. 988.

A patient with tularemia had a cutaneous eruption closely resembling sporotrichosis which could not be excluded on clinical grounds alone. A diagnosis of tularemia was made because of the positive agglutination tests of the patients blood serum for tularemia, repeated negative cultures for the sporothrix and the failure of the eruption to respond to potassium iodid by mouth. A clinical feature not in accord with the diagnosis was the subsequent necrosis of the axillary and epitrochlear lymph-glands.

PATHOGENIC SPORE-BEARING ANAEROBES IN THE CARCASSES OF SHEEP. I. E. Newson, Floyd Cross and Herta S. Dobbins. Jour. Inf. Dis., xlv (1929), 5, p. 386.

Clostridium oedematis had been isolated from the tissues of many sheep which had died with a condition diagnosed as overeating. The authors found, however, that this organism could be isolated from the spleens of sheep which had died of other condi-

tions. *Cl. oedematis* was isolated from 29 per cent of the 200 carcasses examined in a routine manner, without regard to the clinical diagnosis. In most of the classified list of diseases *Cl. oedematis* was isolated from the tissues in a higher percentage than in overeating. This organism has no etiological significance in the spleens of sheep dying of overeating or of any of the other maladies listed. Since *Cl. oedematis* is a normal inhabitant of the intestinal canal, its presence in the spleen could be described as postmortem invasion. The longer the animal had been dead the greater was the likelihood of obtaining positive cultures, which emphasizes the unreliability, for diagnostic purposes, of anaerobic cultures made from animals that have been dead for some hours. Eight additional cultures of anaerobes were isolated: five *Cl. welchii*, two *Cl. novyi* and one undetermined. The authors in conclusion do not wish to cast doubt on the etiologic role of *Cl. oedematis* in malignant edema, gaseous edema, or gas gangrene of sheep, but wish to emphasize that caution should be used in attributing a septicemic disease to one of the spore-bearing anaerobes.

TIERARZT UND BANGSUCHE KRANKHEIT. (The Veterinarian and Bang's Disease.) Dr. K. Poppe. Deut. Tierarzt. Wehnschr., xliv (1929), p. 689.

The agglutination test shows, in the same manner as in cattle, only that infection is or has been present. After the disappearance of clinical symptoms agglutination and complement fixation may be positive for a long time, even for years. Bacteriological proof may often be obtained by guinea pig inoculation of blood and urine. Intracutaneous injection of 0.1 cc of a filtrate of Bang's organism in salt solution produces a rise in temperature, fever remaining for several days, reddening at the site of injection, with pain and general weakness for three or four days. In non-infected persons there is only a slight reddening at the site of injection, with prolonged or general symptoms. Diagnosis is regarded as certain if the picture of the disease and serological and bacteriological findings correspond. Serological findings cannot be regarded as sufficient for a positive diagnosis. Chemotherapy of any value has to be proved further. A verdict as to the value of the vaccination treatment cannot be rendered at this time. Bang's bacterium may produce a typical disease picture in man but it does not possess a great pathogenicity. Besides those in-

fections which show clinical symptoms, there are also symptomless (resting) infections. The latter includes those cases which show antibodies against the Bang organism without showing any symptoms of disease.

THE ISOLATION OF SALMONELLA PULLORUM FROM THE LIVER, HEART'S BLOOD AND YOLK OF YOUNG CHICKENS. H. C. H. Kernkamp. Poultry Science, ix (1929), 1, p. 13.

Salmonella pullorum can be isolated from the livers of affected baby chicks in a large percentage of the cases. In down-covered chicks affected with pullorum disease the causative organism was obtained from the livers in 92 per cent of the cases. From chicks of the same age the organism was isolated on an average of 73.4 per cent of the times from the yolk and 66.3 per cent from the heart-blood. The data on the chicks ranging from three to eight weeks of age show that the organism can be recovered from the heart-blood in a greater percentage of the cases than from the yolk. In chicks of this age the causative organism was isolated from the heart-blood of 50.5 per cent, from the yolks of 39.6 per cent, and from the livers of 76.7 per cent. The author concludes that when but few chicks are submitted for diagnosis, cultures should be taken from the liver, heart-blood and yolk; when three or more chicks are available from the same flock at the same time, it is not necessary to culture all three tissues; when six or more chicks are available under the same conditions, bacteriological examination can be confined to the livers only. Any bacteriological examination of baby chicks which is confined to the blood alone is strongly condemned.

WINTER SUNLIGHT, ULTRA VIOLET LIGHT AND GLASS SUBSTITUTES IN THE PREVENTION OF RICKETS IN GROWING CHICKS. H. T. Scott, E. B. Hart and J. G. Halpin. Poultry Science, ix (1929), 1, p. 65.

Various glass substitutes having the ability to transmit rays of short wave-length have proven beneficial in the prevention of rickets in growing chicks. The beneficial effect depends upon the time of exposure, thickness and transmissibility of the glass, and the intensity of the active rays. With the particular lamp and glass filters used, normal calcification was induced when the chicks were irradiated ten minutes or three minutes daily, in all cases except window glass. Three minutes per week was insufficient

except when the chicks were exposed to the direct rays of the quartz-mercury lamp. The antirachitic effect of the sun's rays through the glass filters, when the chicks were exposed for the entire daylight period, brought about normal calcification during the four seasons of the year 1927-1928. A few exceptions were noted. A sharp increase in the antirachitic effect of sunshine occurred during January and February. Prolonged exposure decreased the transmissibility of the vital rays in all of the substitutes.

THE ORAL ADMINISTRATION OF CERTAIN ALKYL RESORCINOLS AND THEIR EFFECT UPON THE INTESTINAL PROTOZOA AND BACTERIA OF RATS AND UPON INTESTINAL PROTOZOA IN CHICKS. Herbert L. Ratcliffe. Amer. Jour. Hyg., x (1929), 3, p. 643.

Observations on the effects of n-butyl, n-hexyl, n-heptyl and n-octyl resorcinol upon the intestinal protozoa and bacteria of rats indicate that these drugs produce a rapid change in the intestinal flora. One per cent of the resorcinol derivatives was added to a diet which normally promotes a predominance of *Lactobacillus acidophilus*, and each compound fed for fifteen days to a separate group of ten rats. At the end of this time, bacterial counts made on cecal material from these animals indicated that the Gram-positive bacteria were practically absent. The Gram-negative organisms, principally *Bacterium aerogenes*, were predominant. All of the rats were infected with *Trichomonas muris*, *Trichomonas parva*, and *Endamoeba muris* at the beginning of the feeding period. When the rats were again examined after fifteen days on the respective mixtures, *Trichomonas muris* and *Endamoeba muris* were absent in all cases. *Trichomonas parva* had been reduced to about 10 per cent of the original number by n-butyl and n-hexyl resorcinol. Four of the rats on n-heptyl resorcinol and 7 on n-octyl resorcinol were entirely negative for protozoa. The number of bacteria and protozoa in control rats on the unchanged diet remained normal. Two groups of young chicks, one group infected with *Trichomonas* gallinarum, the other infected with *Trichomonas hominis*, were fed a diet containing 1 per cent n-heptyl resorcinol for five days. At the end of this time both groups were entirely free from the flagellates. The controls all had heavy infections.

ROUS SARCOMA OF THE FOWL. E. Fraenkel. Abst. in Arch. Path., viii (1929), 6, p. 1006.

From his experiments Fraenkel concludes that there can be no question that Rous sarcoma may be produced by cell-free material. He disagrees with Gye's conclusion that a second excitant is necessary, since the filtrable agent alone in sufficient quantity produces a tumor. In all respects, this agent conducts itself as a ferment; it is associated with the euglobulin portion of the albuminous content of the filtrate. To meet all of the requirements of the phenomena of the action of this agent, it would appear necessary to regard it as a transferable, reproducing ferment, similar to the bacteriophages.

THE AGENT OF THE ROUS SARCOMA. E. Fraenkel. Abst. in Arch. Path., viii (1929), 6, p. 1007.

Attempts at the cultivation *in vitro* of the filtrable agent of the Rous sarcoma were unsuccessful, although the agent remained active after incubation for seven days at 37° C. in sterile bouillon. While reducing agents did not affect the activity of the filtrate this was rapidly destroyed by the introduction of oxygen.

NEW CESTODE IN THE DOG. Reed O. Christenson. Jour. Parasitol., xvi (1929), 1, p. 49.

The author describes in detail a new cestode in the dog and for which he suggests the name, *Multiceps packi*. This cestode develops from a coenurus which occurs in the varying hares of northern Minnesota. The cyst is not notably different from that of *Multiceps serialis*. If fed to a dog, numerous worms develop, reaching the gravid stage in seven to eight weeks. It is very probable that related carnivores in the northern sections will be found to be natural hosts of this parasite. Further investigations will be undertaken to determine its prevalence in the intermediate host and its development in the primary host.

Tuberculosis Eradication in Wisconsin

The last county in Wisconsin has taken the necessary steps to secure the tuberculin-testing of all its cattle. This insures the testing of all the cattle in the Badger State within the next few months. On June 30, 1929, a total of 6,825,976 cattle had been tuberculin-tested in Wisconsin, and 148,584 reactors (2.2 per cent) removed.

ARMY VETERINARY SERVICE

CHANGES RELATIVE TO VETERINARY OFFICERS

Regular Army

The retirement from active service because of age of Colonel Walter R. Pick, effective January 15, 1930, is announced.

Captain T. A. Breen has been granted a leave of absence for three months terminating March 18, 1930, at which time he will be transferred to the retired list.

The promotion of Major Burton A. Seeley to the grade of lieutenant-colonel, effective November 27, 1929, is announced.

Captain E. L. Nye has been relieved from duty in the Office of the Surgeon General, effective January 28, 1930, and will take the next course of instruction at the Medical Field Service School. After completion of the course, Captain Nye will proceed to Salt Lake City, Utah, for duty with the Remount Purchasing and Breeding Headquarters.

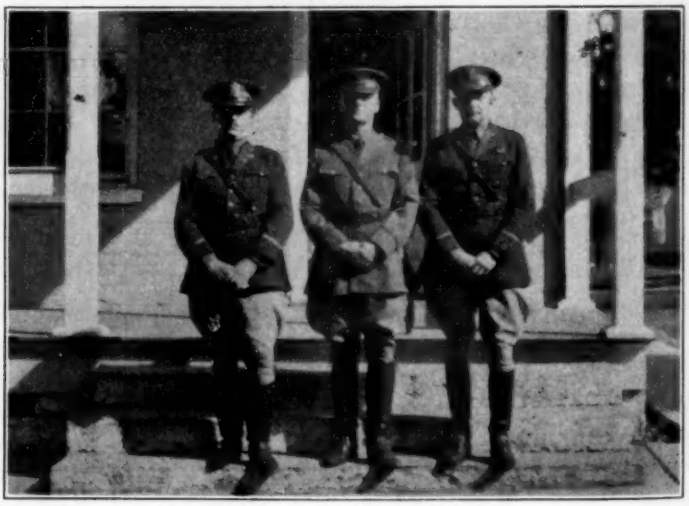
Reserve Corps

Promotions

Leibold, Armin Anton...to Major....419 N. Washington St., Park Ridge, Ill.
Thiele, Lester W.....to Major....5406 37th St., Milwaukee, Wisc.
Curry, Jos. Michael.....to Major....39 Hartland St., Hartford, Conn.
Stotchik, Julius.....to Major....P. O. Box 414, Galesburg, Ill.

Reserve Officers at Carlisle Barracks

Three veterinarians attended the 1929 course for field officers of the National Guard and Reserve at the Medical Field Service



Veterinarians at Carlisle Barracks

School, Carlisle Barracks, Pennsylvania, September 1 to October 15, 1929. They are shown in the accompanying photograph: (left to right) Major D. M. Campbell, Chicago, Ill.; Capt. S. W. Alford, Lincoln, Nebr., and Capt. H. M. Clarvoe, Tampa, Fla.

The class included officers of the Medical Department of the National Guard and the Reserve. Of the four attaining the highest grades, three were veterinarians, Major Campbell winning a gold medal and Capt. Alford a saber.

Carlisle Barracks in one of the very old military posts in the United States, dating back to colonial history. It was one of the most important frontier posts during the French and Indian War. During the Revolutionary War many Hessian prisoners were confined there and a guard-house built by them is still in use.

Farm Live Stock Value Increases

The value of live stock on farms in the United States, January 1, has been estimated by the Department of Agriculture at $5,864,969,000, compared with $6,003,598,000 a year ago and $5,514,426 000 two years ago.

The numbers and value of the different kinds of animals are:

Farm Animals	*Total Number*	*Value*
Horses and colts	13,440,000	$ 950,318,000
Mules and mule colts	5,322,000	441,726,000
Cattle and calves	57,967,000	3,320,104,000
Sheep and lambs	48,913,000	435,515,000
Swine (including pigs)	52,600,000	717,306,000
Cows and heifers	22,499,000	1,876,357,000

The number of live stock not on farms, but in cities and villages, is not estimated yearly, but in 1920 was reported by the census as:

Horses	1,705,611
Mules	378,250
All cattle	2,111,527
Sheep	450,042
Swine	2,638,389

Area Work Stands the Test

A number of areas in the state of Vermont were recently retested for reaccreditation, and only 0.2 per cent of infection was found. These areas are located in sections of the Green Mountain State in which infection was as high as 15 per cent when tuberculosis-eradication work was begun under the cooperative plan.

International Exhibition of Hygiene

The creation of the German Museum of Hygiene, as an appendage to the Central Institute for the Cultivation of Health, suggested the simultaneous inauguration of a big International Exhibition of Hygiene, to be opened on May 17, 1930, at Dresden, Germany, and to remain open until October. What a change has taken place in this humanly important branch of science since 1911! The generation which has meantime grown up has to live under utterly different conditions and has itself set up quite a fresh standard in regard to health and its preservation.

Humanity and racial hygiene, motherhood and infancy, health and sickness, nutrition, the cultivation of health at different times and among the different peoples, physical culture and gymnastics, vocational hygiene, clothing, foodstuffs, superstitions and science, the mind and mental hygiene, in brief, the great human problem of the present day is what the Dresden International Exhibition of Hygiene will deal with in the year 1930.

What an echo the Dresden International Exhibition of Hygiene has awakened is demonstrated by the fact that twenty foreign countries have already indicated their participation therein. Around the "Platz der Nationen" (Square of Nations) will be assembled: Austria, Bulgaria, Chile, Czechoslovakia, China, Danzig, Finland, France, Great Britain, Latvia, Mexico, the Netherlands, Peru, Polonia, Roumania, Switzerland, Soviet-Russia, Turkey, the Union of South Africa and the United States of America; here, too, the League of Nations and the International Labor Office will be represented.

In all sections of the International Exhibition of Hygiene, science and industry co-operate towards a common goal. Theory is here awakened to life by industrial practice. The halls of this exhibition will present a city in miniature; while the beautifully laid-out grounds will provide ample opportunity for recreation, inasmuch as they will contain an "Avenue of One Hundred

Fountains" fantastically and enchantingly illuminated. Entertainments of all sorts will take place daily.

Those who will participate in the European tour of the American Veterinary Medical Association will have the unexcelled opportunity of visiting this great International Exhibition of Hygiene, and this opportunity will be only one of the many wonderful experiences afforded to the members of the party.

The Society of Phi Zeta

The veterinary profession of America now has an honorary society for the recognition of scholarship and professional ideals similar in scope and operation to those long existing in medicine, journalism, engineering and other scientific and practical professions.

The Society of Phi Zeta was organized at the New York State Veterinary College at Cornell University, in 1925, by a group of upper-class students and faculty members. A constitution for a national organization was drawn up. In 1928 a charter for a second chapter was granted to a group of petitioners in the Veterinary School of the University of Pennsylvania. In the course of time chapters probably will be formed in other veterinary colleges of this country.

A national organization was set up at the time of the A. V. M. A. meeting in Detroit in August, 1929. The national officers selected by the delegates in attendance at this meeting are as follows: President, Dr. Veranus A. Moore; Vice-President, Dr. Louis A. Klein; Secretary, Dr. William A. Hagan. The Executive Committee consists of Drs. H. E. Bemis, H. J. Milks, C. J. Marshall, J. A. S. Millar and Reuben Gordon.

Membership in the Society is of two classes, active and honorary. Graduates of recognized veterinary schools who have attained high rank in their profession may be elected to active membership by any chapter, but the greatest number of active members will be recruited from the junior and senior classes in the veterinary schools.

To be eligible for election in his junior year, the student must be of good moral character, of acceptable personality and must rank in the highest 10 per cent of his class in scholarship. To be eligible for election in his senior year, the student must have the same qualifications except that he must rank only in the highest 25 per cent of his class in scholarship.

The symbol or emblem of the Society is a key, worn as a watch-charm, which was designed by the late Louis Agassiz Fuertes. It consists of the letter Phi, cut in block, superimposed upon the letter Zeta, these letters being derived from the Greek words "philo" and "zoa," meaning "to love animals."

A World's Record

Stanton, Nebraska, has made a bid for fame. The town is the home of Dr. Leonard Collins (K. C. V. C. '08) and about 1549 other citizens, according to the latest available information. Stanton's bid for fame, however, is based on the fact that six of the town's young men are studying veterinary medicine, three at Iowa State College and three at Kansas State Agricultural College. In the number is G. L. Collins, son of Dr. Collins. All were home during the recent Christmas holidays and got together for a photograph which is reproduced here.

STANTON'S SEVEN

In the front row (left to right) are Dr. Collins, W. J. Price (K. S. A. C.), G. L. Collins (I. S. C.) and N. L. Ditman (I. S. C.). In the back row are J. L. Hoke (K. S. A. C.), D. H. Spangler (K. S. A. C.) and H. D. Perry (I. S. C.). Is there a city or town in the United States, or in the world, for that matter, that can beat this record?

Repeat orders are being received for the JOURNAL binders, Ask to see one on approval. Returnable if not entirely satisfactory.

VETERINARY MEDICAL ASSOCIATION OF NEW YORK CITY

The regular monthly meeting of the Veterinary Medical Association of New York City was held at the Academy of Medicine Building, 103rd Street and Fifth Avenue, New York City, on Wednesday evening, December 4, at 8 p. m. Dr. H. K. Miller, President, called the meeting to order.

Dr. Roy H. Spaulding, of White Plains, New York, was the speaker of the evening, his subject being "Follicular Mange and Its Treatment." He brought out the fact that follicular mange was quite common in English, French and Boston bulls. He stated that sometimes the parasites were found in the feces as well as in the skin. He had followed up several cases and found that the offspring inherited the disease, and did not recommend breeding from those afflicted with it. His treatment was dipping in a dilute solution of lime and sulphur dip, which had been heated; also the application of ether and alcohol, and chrysarobin. He made mention of the fact that he believed that the transmission occurred a great many times before birth.

Dr. O. E. McKim recommended that, in the interest of preventing propagation of the disease, these cases be reported to the Kennel Club so that they would not be bred. He also brought out the fact that the disease can be produced artificially by feeding infected material. Dr. C. G. Rohrer made mention of the fact that quite frequently one or two cases will occur in a litter and others of the litter will not be affected. Dr. R. W. Gannett stated that with many poor people it was advisable to give them medication so that they could treat the dog at home. It was also brought out in the discussion that follicular mange, in a few rare cases, has been transmitted to the human family. Dr. Geo. W. Little stated that it might be advisable to change the name from follicular mange to acariasis.

Dr. Spaulding stated that the veterinarians on the accredited list of the state of New York were desirous of obtaining support and outlined the reason and the necessary steps to be followed.

Dr. McKim brought out the fact that the law should be changed in the state of New York in regards to the payment of damages, caused by the depredations of dogs. He stated that there was a large sinking fund in Albany, which should be used to compensate individuals for property destroyed by dogs. As it now stands, the law reads that compensation shall be paid for depredation caused by dogs to sheep, whereas, it should read, "depredation caused by dogs, irrespective of what the nature might be." Motion made and seconded to refer the matter to the Legislative Committee with power to act.

Dr. C. L. Phillips and Dr. Richards were elected to membership in the Association. The Secretary's financial statements were audited, corrected and approved.

In the election of officers, Dr. R. J. Garbutt was elected president, Dr. Harry Ticehurst, vice-president, and Dr. Jack Crawford, secretary. Board of Censors: Dr. L. W. Goodman, Dr. C. G. Rohrer, Dr. Geo. W. Little, Dr. J. B. Engle and Dr. Sol Shapera.

A rising vote of thanks was extended to Dr. Spaulding for his interesting and constructive paper.

R. J. GARBUTT, *Secretary.*

NEBRASKA STATE VETERINARY MEDICAL ASSOCIATION

The thirty-second annual meeting of the Nebraska State Veterinary Medical Association was held at Hotel Yancey, Grand Island, December 10-11, 1929. The meeting was called to order by Dr. E. C. Jones, President, of Grand Island, shortly after nine o'clock. The minutes of the 1928 meeting, read by Dr. B. Witt, Secretary, of Scribner, were approved as read.

In his presidential address, Dr. Jones set forth the wealth of live stock in Nebraska, thereby showing the necessity of good veterinary services. He also urged the importance of local, county, state and national organization. Dr. Jones favored the continuance of *The Hypodermic.*

The first technical paper was by Dr. Ashe Lockhart, of Kansas City, Mo., on "Diphtheroid Organisms and Their Complications." This created considerable interest and an active dis-

cussion followed. Dr. R. R. Dykstra, of Manhattan, Kans., brought out the importance of alkalining the animal system in addition to biologic treatment.

Dr. C. H. Hays, State Veterinarian, was the next speaker and urged that the out-of-state requirements on interstate movement of cattle be more closely observed and adhered to. Dr. Hays considered infectious abortion of cattle of great economic importance. He also favored the agglutination test, uniform testing and the standardization of the antigen.

Dr. Frank Breed, of Lincoln, gave a very interesting talk on the pathological changes in certain organs and tissues in a number of diseases. He also favored a uniform method for holding autopsies and showed how to prepare tissues to be sent to a laboratory for diagnosis.

Dr. John Patterson, of Hedrick, Iowa, was the first to appear on the program after the noon luncheon. His topic was "Poultry Diseases and Their Treatment." The more important diseases were described as to their symptoms, diagnosis and treatment. He also urged the importance of uniform postmortem technic and discouraged the prescribing of treatment without seeing the fowls. Dr. Patterson deemed poultry practice a very important part of the veterinarian's work.

Dr. R. R. Dykstra, of Manhattan, Kans., gave a very interesting paper on local anesthetics in veterinary practice. His paper was reinforced by lantern-slides showing where the anesthetic should be injected to obtain the best results. Nerve-blocking is becoming more and more useful in veterinary surgery. Dr. Dykstra also distributed a printed outline showing the location of parts affected by the anesthetic.

Dr. E. J. Frick, of Manhattan, Kans., read a paper, "A Clinician's Experiences with Parasiticides." This subject was of great interest and gave way to an active discussion, after which the meeting adjourned.

Second Day

Dr. I. E. Newsom, of Fort Collins, Colo., gave a paper on diseases of sheep. He had a number of lantern-slides which he used in connection with his paper and in that way was able to make his message more clearly and better understood.

Dr. R. F. Bourne, of Fort Collins, Colo., presented a paper on modern advances in veterinary physiology. His paper was full

of many interesting things, especially that of internal secretions and the influences they have on the system.

Dr. F. E. Welch, of Ames, Iowa, gave a very interesting paper on cattle diseases, especially those of a digestive nature. He emphasized careful diagnosis and the selection of proper treatment. He also made mention of a few drugs which act upon the digestive organs.

Dr. Carl J. Norden, of Lincoln, presented the Association with a two-reel motion picture on rabies in the human. Everybody enjoyed the picture very much and it was surely a great lesson to all. Dr. Norden procured this picture from Dr. Julius H. Hess, of Chicago, Ill., a child specialist at the University of Illinois, College of Medicine.

Dr. L. Van Es presented a very enlightening and interesting paper on undulant fever and outlined the possibilities of it being transmitted from cattle infected with contagious abortion to man, by direct contact or through the milk supply.

The last feature of the program was Dr. A. T. Kinsley, of Kansas City, Mo., with a round-table discussion on swine diseases. Dr. Kinsley is a past master along this line, as he always has something of interest to offer.

The following officers were elected: President, Dr. Floyd Perrin, Lincoln; vice-president, Dr. D. E. Trump, Utica; secretary-treasurer, Dr. B. Witt, Scribner. Dr. R. R. Dykstra was elected an honorary member of the Association. Dr. J. D. Sprague, of David City, Dr. J. S. Anderson, of Hastings, Dr. W. H. Tuck, of Weeping Water, were elected as life members of the Association and fifteen applicants were elected to active membership.

President E. C. Jones was happily surprised and honored when Mr. D. J. Trail, secretary of the Grand Island Chamber of Commerce, presented him with a gavel which was made out of a piece of timber from the first store in Grand Island.

The annual banquet was well attended. Some 200 covers were laid. Dr. D. W. Hurst acted as toastmaster. Judge B. H. Paine, of Grand Island, was the speaker of the evening. After the banquet the remainder of the evening was spent in dancing and visiting.

Lincoln, Nebraska, was chosen for the 1930 convention.

B. Witt, *Secretary.*

PURDUE UNIVERSITY VETERINARY SHORT COURSE

The annual Short Course for Veterinarians was held at Purdue University, LaFayette, Indiana, November 12-13-14, 1929. The poultry disease program was given Tuesday, November 12, and was attended by nearly 100 veterinarians. The two laboratory exercises, one a demonstration of the rapid and tube agglutination tests for pullorum disease, and the other, the gross pathology of important poultry diseases, occupied the entire day. A large number of diseased birds were used in these laboratory exercises, and each veterinarian had an opportunity to study the lesions shown by the individual birds. Doctors Mathews, Doyle, Walkey and Bullard were in charge of the testing and poultry disease demonstrations. The controller of the University, Mr. R. B. Stewart, welcomed the veterinarians to the University. The controller is expected to be well informed regarding the institution that he represents, and Mr. Stewart not only lived up to expectations, but was able to crowd into his brief address the important things and discuss them in a most interesting way.

One hundred and seventy-five veterinarians were present the second day, which was devoted to a discussion of infectious abortion in the morning and to a cattle clinic in the afternoon. Dr. F. H. Brown, State Veterinarian, discussed the Clean Herd Plan and regulations for the control of Bang disease. He emphasized in the discussion of the Clean Herd Plan the opportunity that this plan offered to the veterinarian who wished to take up this disease control work, and render a valuable service to the cattle industry.

"The Practicing Veterinarian in Relation to Bang Disease Control" was the subject of the address given by Dr. H. R. Church, of the Pennsylvania Bureau of Animal Industry. Dr. Church discussed the Pennsylvania Plan for the control of Bang disease, the progress made in the control and eradication of the disease in dairy and breeding herds in his state, and the cooperation given by practicing veterinarians. His address was very interesting and gave the veterinarians first-hand information relative to the successful operation of a clean herd plan.

Professor E. A. Gannon, dairy extension specialist, Purdue University Agricultural Extension Department, discussed Bang disease in relation to the dairy industry and the economic importance of its control and eradication. He stated that Indiana veterinarians had not impressed dairymen with the economic

importance of employing veterinarians regularly, and that this disease control project offered an opportunity to demonstrate that loss from disease can be reduced in dairy herds if more prompt and intelligent methods of treatment are practiced. Dr. T. H. Ferguson, president of the American Veterinary Medical Association, Lake Geneva, Wisconsin, had charge of the cattle clinic. He was assisted by Drs. Tom Sigler and J. F. Bullard. The clinic proved of unusual interest and continued until 6:00 p. m. All of the surgical cases have made uneventful recoveries.

Dr. F. H. Brown, State Veterinarian, was toastmaster at the dinner which followed the clinic. Short talks were given by Drs. T. H. Ferguson, J. E. Gibson and others. Dr. H. Preston Hoskins, secretary-editor of the American Veterinary Medical Association, was the principal speaker. The subject of his address was "The Purpose and Work of the American Veterinary Medical Association." The 67 veterinarians who heard this most interesting address appreciated as never before the splendid work that the Association is doing for the advancement of the profession.

Tuesday morning, November 14, T. R. Johnston, Director of Bureau of Publicity, Purdue University, addressed the veterinarians on the subject of publicity. He discussed the importance of educational publicity work, and referred to other professional publicity departments. He stated that professional and service publicity had enabled this class of organizations to give better service.

Dr. J. V. Lacroix, editor of the *North American Veterinarian*, lectured on the diseases of the digestive tract of the dog during one period Thursday morning; and conducted a small-animal clinic during the afternoon. In the clinic, Dr. Lacroix demonstrated methods of making a clinical examination of the dog and then demonstrated methods of treating fractures in dogs. He also operated on an umbilical hernia in a cat and demonstrated his method of ovariectomy in the bitch. Drs. G. M. Funkhouser and J. F. Bullard gave able assistance during the clinic.

R. A. Craig.

KANSAS VETERINARY MEDICAL ASSOCIATION

The twenty-sixth annual meeting of the Kansas Veterinary Medical Association was held at the Kansas State Agricultural College, Manhattan, January 7-8, 1930. The sessions were presided over by Dr. E. F. Kubin, of McPherson, who delivered

the presidential address as the first number on the program. Following the reports of the standing committees, the address of welcome to the Association was delivered by President F. D. Farrell, of the College. Dr. S. F. Stewart, of Olathe, made the response.

Addresses at the Tuesday morning session included the following:

"Pulmonary Edema in Cattle," Dr. S. E. Hayes, Hutchinson.
"Local Anesthesia" (Illustrated), Dr. R. R. Dykstra, Manhattan.

At the Tuesday afternoon session the following subjects were presented:

"A New Shipping Fever Project," Dr. H. F. Lienhardt, Manhattan.
"Shipping Fever from the Standpoint of the Live Stock Owner," Mr. J. H. Mercer, Commissioner, Topeka.
"Veterinary Medical Manufacturing—It's Future," Dr. J. H. Weiner, Kansas City, Mo.
"Examination of Horses for Unsoundness and Lameness," Col. R. J. Stancliff, Veterinary Corps, U. S. A., Fort Riley.
"Observations on Anaplasmosis," Dr. T. P. Crispell, Parsons.
"The Cow, the Milk, the Inspection," Dr. James F. Adee, Topeka.
"Diseases and Surgery of the Udder of Cows," Dr. T. H. Ferguson, Lake Geneva, Wis.

The banquet was held Tuesday evening, with Dr. Kubin presiding as toastmaster. Those who responded to toasts included Col. R. J. Stancliff, for the Army; Dr. P. B. Darlington, for the Kansas Veterinary Medical Association; and Dr. T. H. Ferguson, for the American Veterinary Medical Association. Motion pictures followed the banquet.

The Wednesday morning program included the following:

"Inspection of Poultry as Carried on by the U. S. Bureau of Agricultural Economics," Dr. C. H. Kitselman, Manhattan.
"Investigation Concerning the Transmission and Etiology of Hog Cholera," Dr. C. N. McBryde, Ames, Iowa.
"Genital Diseases of Cattle," Dr. H. E. Kingman, Fort Collins, Colo.

Wednesday afternoon was devoted to the clinic, under the general supervision of Dr. T. H. Ferguson. The program included:

"Cesarean Operation in the Sow," Dr. E. J. Frick, Manhattan.
"Epidural Anesthesia of Horse, Cow, Dog, Swine, and Cat," Dr. E. R. Frank, Manhattan.
Demonstration of Hog Cholera Vaccination, Dr. B. W. Conrad, Sabetha.
Demonstration of Worming Hogs, Dr. A. F. Wempe, Marysville.
"Antimortem and Postmortem Diagnosis of Swine Diseases," Dr. A. T. Kinsley, Kansas City, Mo.
Demonstration of Bleeding and the Rapid Plate and Tube Methods for Agglutination Testing for Bacillary White Diarrhea and Abortion Disease, Drs. C. H. Kitselman and C. A. Brandley, Manhattan.
"Passing the Stomach Tube in Domesticated Animals," Dr. E. J. Frick, Manhattan.

The election of officers held at the Wednesday morning session resulted as follows: President, Dr. L. E. Bruncher, Mulvane; vice-president, Dr. W. M. Dicke, Paola; secretary-treasurer, Dr. C. W. Bower, Topeka; member of Executive Board, Dr. LeRoy Dietrich, Wichita.

R. R. D.

OKLAHOMA STATE VETERINARY MEDICAL ASSOCIATION

The Oklahoma State Veterinary Medical Association held its 15th annual meeting in Oklahoma City, with headquarters at the Huckins Hotel, January 13-14, 1930.

That Oklahoma veterinarians have the proper appreciation of the importance of their state organization was amply demonstrated by an unusually good attendance despite very unfavorable weather conditions and nearly impassable roads. The interest that was displayed in discussing the various subjects on the program shows plainly that our members have the true conception of the meaning of these meetings, regarding them as what they in reality are or should be, namely, extension courses in veterinary science.

The Association was fortunate in securing some very outstanding talent to present a program of timely and current topics, most of which are of vital concern to the veterinary profession of today. The program consisted of the following subjects, all of which were presented in an exceptionally able manner:

"Recent Observations on Anaplasmosis of Cattle," Dr. Geo. W. Stiles, Jr., Denver, Colo.
"Contagious Abortion, Incidence, Relation to Public Health and Control Measures," Dr. L. H. Moe, Stillwater.
"Canine Distemper, Present Status of Its Control," Dr. Ashe Lockhart, Kansas City, Mo.
"Poultry Diseases, A New Field for the Veterinarian," Dr. H. W. Orr, Stillwater.
"Stockyards or Shipping Fever in Stocker Cattle," Dr. A. T. Kinsley, Kansas City, Mo.
"How the Clinical Laboratory Can Aid the Veterinarian," Dr. D. T. Bowden, Director, Oklahoma State Laboratory, Oklahoma City.
"County and Municipal Meat Inspection," Dr. E. T. Martin, Tulsa.
"The Domestic Rabbit and Cavy, Husbandry, Management, Common Diseases and their Control," Dr. H. W. Ayers, Oklahoma City.
"Swamp Fever in the Horse, Diagnosis and Treatment," Dr. C. C. Nickel, Nowata.
General Round-Table Discussion in charge of Dr. O. E. Robinson, Bixby.

Dr. C. C. Hisel, retiring president, delivered a message to the Association in which he summed up the past year's achievements of the profession and outlined a constructive program of activities

for the future. He pointed out some of the outstanding needs of the Association, laying particular stress on the necessity of working for desirable and necessary legislation in the interest of the veterinary profession. The entire message was filled with thoughts worthy of serious consideration by every member of the Association.

A banquet was served at the Huckins Hotel, on the evening of January 13, at which a number of distinguished guests were entertained. The entertainment consisted of a program of music songs and humorous addresses.

By vote of the Association, it was decided to hold the next semi-annual meeting in Stillwater, in connection with a short course of three days' duration, the exact dates to be decided by the Executive Committee and announced later.

Officers for the ensuing year were elected as follows: President, Dr. Frank R. Knotts, Stillwater; vice-president, Dr. H. W. Ayers, Oklahoma City; secretary, Dr. C. H. Fauks, Oklahoma City; treasurer, Dr. F. Y. S. Moore, McAlester.

C. H. Fauks, *Secretary*

WEST VIRGINIA VETERINARY MEDICAL ASSOCIATION

West Virginia is one of the few states that has been without a state veterinary organization for some years, but on January 3, 1930, a number of veterinarians met in Charleston and organized the West Virginia Veterinary Medical Association, with the following officers: President, Dr. H. B. Langdon, Charles Town; vice-president, Dr. F. K. McClure, Clarksburg; and secretary-treasurer, Dr. J. H. Rietz, Morgantown. The organization of an association in West Virginia brings the number of state associations in the United States up to forty-four. According to the latest available information, no state association exists in Idaho, New Mexico, Rhode Island or Wyoming.

War Against Waste

In a recent statement, Hon. M. G. Thornburg, Secretary of the Iowa Department of Agriculture, characterized the tuberculin-testing of cattle as a "War Against Waste," as follows:

> The eradication of bovine tuberculosis, not only as it affects cattle, but also other forms of live stock, is a direct drive against the waste caused by disease. It is also important in preventing waste of human efficiency through the ravages of tuberculosis contracted by consuming live stock products from untested animals.

NECROLOGY

LORENZO P. GARRAHAN

Dr. Lorenzo P. Garrahan, of Buenos Aires, Argentina, died October 2, 1929, after a brief illness.

Born in Buenos Aires, October 8, 1886, he attended local schools and the National College of Buenos Aires. He received a scholarship from the faculty of the latter institution and studied veterinary medicine at Ohio State University. He received his D. V. M. in 1908 and returned to Argentina. He was appointed professor at the National College and at the Superior Commercial School, "Carlos Pellegrini," attached to the Faculty of Economic Science. At various times he held important positions in the Department of Agriculture. He was technical advisor for the Lederle Sales Corporation.

Dr. Garrahan was an ardent sportsman. He was very fond of golf and at the time of his death was secretary of the Ituzaingo Golf Club. He was a charter member of Alpha Chapter of Alpha Psi Fraternity.

Dr. Garrahan joined the A. V. M. A. in 1929.

GUY E. McINTYRE

Dr. Guy E. McIntyre, of Burlington, Iowa, died in a local hospital December 16, 1929. He was a graduate of the Chicago Veterinary College, class of 1909, and formerly practiced at Seaton, Ill. He is survived by three sons and two brothers.

J. S. LESLIE

Dr. J. S. Leslie, of Galveston, Indiana, died December 21, 1929. He was overcome by fumes from an oil heater in the bathroom of his home.

Born in Tippacanoe County, Indiana, November 6, 1874, Dr. Leslie attended the Ontario Veterinary College and completed his course in 1902. For a number of years he practiced at Flora, Ind., and located at Galveston about eight years ago. During

that time he made many friends and built up a steadily increasing practice. He served as mayor of Galveston for four years and during that time was instrumental in inaugurating a number of municipal improvements.

Dr. Leslie joined the A. V. M. A. in 1924. He is survived by his widow, four brothers and two sisters.

ALFRED F. MARTINS

Dr. Alfred F. Martins, of Newark, N. J., died on his 73rd birthday, December 27, 1929, at St. Vincent's Hospital, New York City, after an illness of a week.

Born in New York City, December 27, 1856, he attended both public and private schools and then entered the American Veterinary College in New York City. He was graduated in 1881 and located at Fishkill, N. Y. He entered the service of the U. S. Bureau of Animal Industry in 1897 and was retired in December, 1926. The greater part of the nearly thirty years in the B. A. I. service was spent at Newark, N. J., in charge of meat inspection.

Dr. Martins first joined the A. V. M. A. in 1883 and again in 1919. He is survived by his widow.

GEORGE HENRY SEAVER

Dr. George H. Seaver, of Pilger, Nebraska, died December 30, 1929, as the result of an automobile accident near Wisner, Nebr.

Born near Geneva, Nebr., July 5, 1890, Dr. Seaver lived on a farm until 1911, when he entered the Kansas City Veterinary College. He was graduated in 1914 and practiced at Ruskin, Nelson, Superior and York, Nebraska, before locating at Pilger. During the late war he entered the Veterinary Corps of the Army, was stationed at Camp Fremont, California, and was discharged with the rank of first lieutenant.

Dr. Seaver is survived by his father and one sister.

JACOB F. THOMSEN

Dr. Jacob F. Thomsen, of Gladbrook, Iowa, died very suddenly, January 2, 1930, in his 46th year. He was a graduate of the Marne, Iowa, High School and the Chicago Veterinary College,

class of 1909. He joined the A. V. M. A. in 1916 and was a member of the Iowa Veterinary Medical Association. A son, Lloyd H., is studying veterinary medicine at Iowa State College.

MAJOR FREDERICK SAVAGE MACDONALD

Major Frederick S. Macdonald, principal veterinary officer of the Province of Manitoba in the Royal Canadian Army Veterinary Corps, died at his home in Winnipeg, January 9, 1930, at the age of 63 years. He was a graduate of the Ontario Veterinary College, class of 1888.

The deceased first came to Winnipeg in 1885 and was the first white youth to go into the Swan Lake District. He attended Rockford Academy and Toronto University. Following his graduation, he practiced at Napanee, Ontario. In 1891 he joined the Royal Canadian Mounted Police and served as Veterinary Officer until 1894. He was also a veteran of the Riel Rebellion. A widow and five sons survive him.

W. H.

CHARLES H. ANTHONY

Dr. Charles H. Anthony, of Oklahoma City, Okla., passed away at his home on January 14, 1930, in his 66th year. His death came after a short illness and was ascribed to natural causes.

Born in Washington, Ill., in 1864, Dr. Anthony attended local grade and high schools, and then entered the Chicago Veterinary College. He was graduated with the class of 1892 and returned to his native town, where he practiced until 1907, when he removed to Oklahoma City. He continued in general practice there and conducted a hospital in conjunction with it.

Dr. Anthony joined the A. V. M. A. in 1917. He served as Resident Secretary for Oklahoma, 1922-1923. He was a member of the Oklahoma State Veterinary Medical Association and served as president for two terms. He is survived by one brother and one sister.

C. H. F.

NEY WOOD BROOKS

Mr. Ney Wood Brooks, of Cedar Rapids, Iowa, died at a local hospital December 30, 1929, of pneumonia. Mr. Brooks was president of the Brooks Veterinary Supply Company, of

Cedar Rapids, and was well-known to the members of the veterinary profession throughout eastern Iowa.

Our sympathy goes out to Dr. R. A. Hendershott in the death of his father at Columbus, Ohio, November 1, 1929; to Dr. O. K. Hoffman, of Hagerstown, Maryland, in the death of his son, Owen Kenneth, December 18, 1929, and to Dr. M. F. Henry, of Woodcliffe-on-Hudson N. Y., in the death of his wife (Nance M. Henry) recently. Mrs. Henry was a sister of the late Mike Murphy, who for many years was athletic coach at the University of Pennsylvania.

PERSONALS

BIRTHS

To Dr. and Mrs. D. W. Gates, of Millheim, Pa., a son, John Daniel, October 18, 1929.

To Dr. and Mrs. J. A. Ellertson, of Madison, Ohio, a son, Judson Downer, December 1, 1929.

PERSONALS

Dr. C. B. McGrath (Iowa '23) is now located at West Point, Nebr.

Dr. C. C. Robenstein (Colo. '20) has removed from Hugo, Colo., to Craig, Nebr.

Dr. George W. Thurber (Chi. '13) has removed from Stevens Point, to Loyal, Wis.

Dr. O. F. Cox (Colo. '21), formerly located at Bedford, Iowa, is now at Harlan, Iowa.

Dr. J. C. Brown (Ont. '15), formerly located at Markham, Ont., has removed to Lansing, Ont.

Dr. James V. McCahon (U. P. '29) has removed from Bryn Mawr, Pa., to Downingtown, Pa.

Dr. J. E. Ellis (K. C. V. C. '03) has changed locations from Boise, Idaho, to Montpelier, Idaho.

Dr. W. F. Sirett (McK. '07), of Minnedosa, Man., was recently elected Mayor of his town.

Dr. C. C. Donelson (Ind. '12) is now with the Shiler Serum Company, of Kansas City, Kans.

Dr. R. L. Gilliam (Wash. '18), formerly located at Oakesdale, Wash., is now at Port Angeles, Wash.

Dr. H. E. McClung (K. S. A. C. '29), formerly located at Glendale, Calif., is now at Hayward, Calif.

Dr. G. M. Garrett (U. P. '07), of West Chester, Pa., is a breeder of Doberman Pinschers and Boston Terriers.

Dr. Edward E. Mass (K. C. V. C. '17), formerly of Columbia, Miss., is now located at Atlanta, Texas.

Dr. Horst Schreck (Ind. '16), formerly of Portland, Ore., is now located at 2130 Texas St., El Paso, Texas.

Dr. R. M. Nyblett (Ont. '02), formerly of Wood Mountain, Sask., gives a new address: Lonesome Butte, Sask.

Dr. W. H. Lake (Ont. '95) was recently elected Mayor of Morden, Man., where he is engaged in general practice.

Dr. E. H. Durr (A. P. I. '24) is now with the Mississippi Live Stock Sanitary Board, with headquarters at Jackson, Miss.

Dr. J. A. Grau (San. Fran. '08), formerly of Yakima, Wash., gives a new address: 1415 West 13th Ave., Spokane, Wash.

Dr. J. W. Hinman (Ont. '75), of Winnipeg, Man., has been seriously ill, but is reported to be making a satisfactory recovery.

Dr. R. A. Dunn (Amer. '91), formerly of Charlottesville, Va., is now located in Beverly Hills, Calif. Address: 348 North Palm Drive.

Dr. H. L. Stevens (Gr. Rap. '06), formerly of Rockland, Maine, has retired from general practice and is now living at Farmington, Maine.

Dr. DuBois Jenkins (Corn. '18), who was with Borden's Farm Products Company, Inc., has been transferred from Oxford, N. Y., to Owego, N. Y.

Dr. Virgil R. Homan (Ind. '18), of Sugar Grove, W. Va., was recently chosen as President of the Pendleton County Court for the fourth consecutive year.

Dr. J. A. Allen (Ont. '16), of Winnipeg, Man., recently returned from a trip to Halifax, Nova Scotia, where he supervised the shipment of 50 pairs of foxes to Sweden.

Dr. M. Shipley (T. H. '17), of Phoenix, Ariz., delivered an address on the control of bovine abortion before the Arizona Milk Producers' Association on December 26.

Dr. Nelson L. Nelson (Iowa '11), formerly with the Sioux Falls Serum Company, at Sioux Falls, S. Dak., is now with the American Veterinary Supply Company, Ames, Iowa.

Dr. Franceso S. Graziadei (Corn. '29) has been appointed deputy veterinarian in the Bureau of Food Hygiene of the city of Utica, N. Y., under Dr. W. G. Hollingworth (Amer. '84).

Dr. J. Hubley Schall (U. P. '28), formerly of Philadelphia, Pa., has taken over the practice and hospital of the late Dr. Glenn B. Kirkwood (K. S. A. C. '23) at Woodside, Long Island, N. Y.

Dr. N. V. James (Ont. '08), formerly of Gladstone, Man., is now attached to the Meat Inspection Division, Health of Animals Branch, Canada Department of Agriculture, and is stationed at Winnipeg, Man.

Dr. Edwin Calldemeier (Chi. '11), of Louisville, Ky., was injured in an automobile accident just before Christmas, when his car skidded into a post when Dr. Calldemeier attempted to slow down at an intersection.